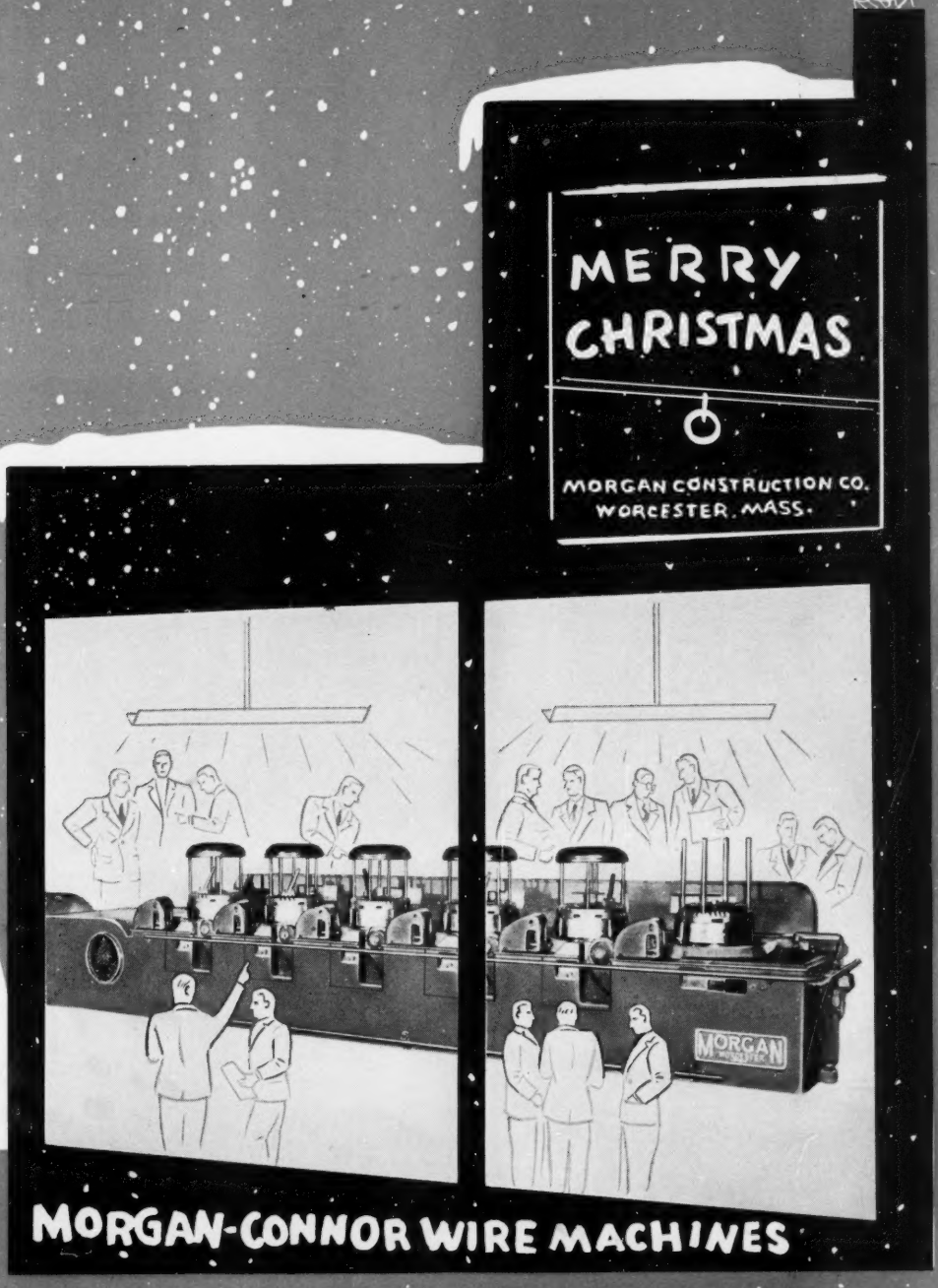
WIRE AND WIRE PRODUCTS

DECEMBER 1949



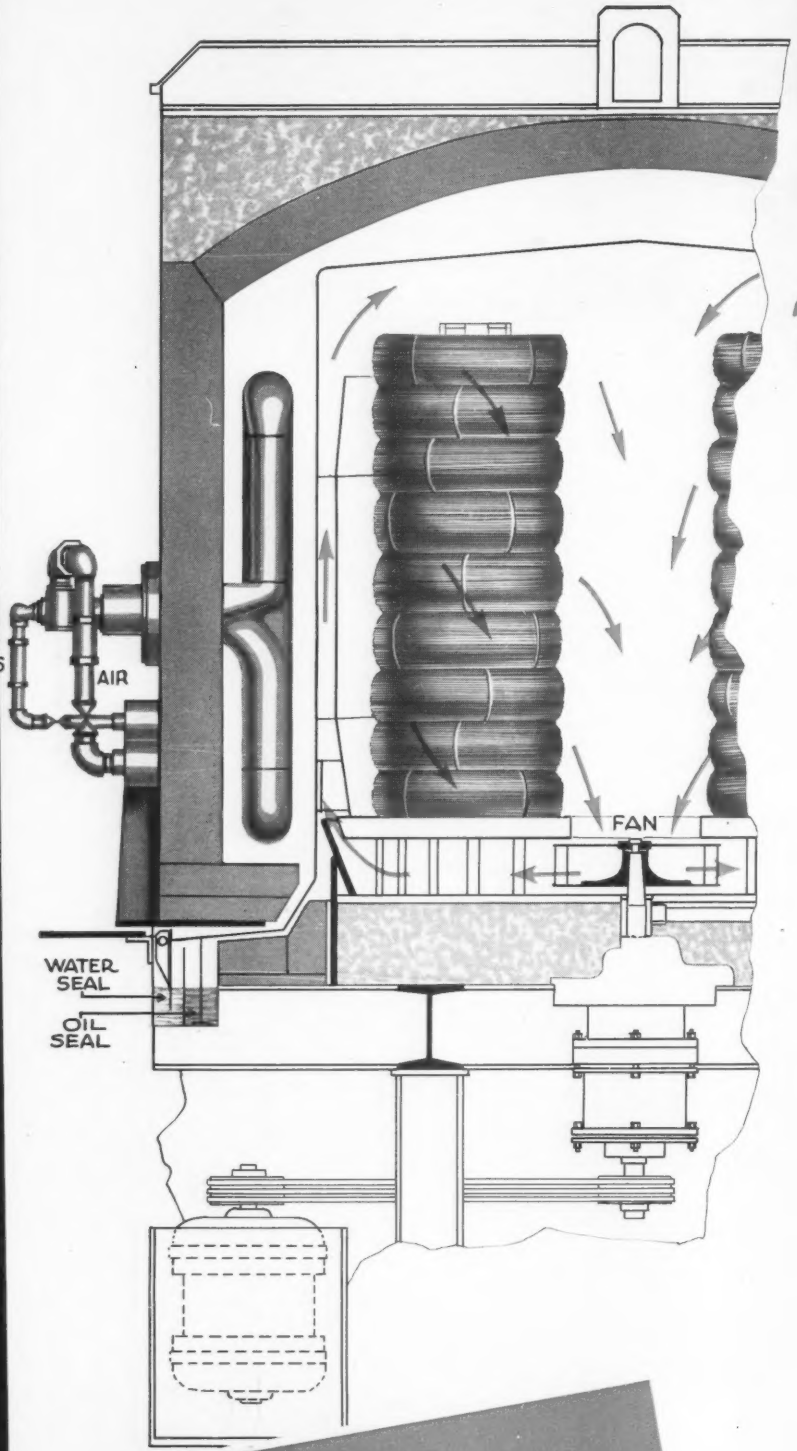
OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

Lee Wilson announces the New

RADIANT CONVECTOR FURNACE

for

Wire Annealing



THIS NEW WIRE ANNEALING furnace utilizes the high speed convection heating system developed for and widely used in Wilson furnaces for strip coil annealing.

A high static, high volume fan, driven by a motor rated from 10 to 20 HP, drives the gases through an annulus between the inner cover and inner cover liner at velocities which produce heat transfers resulting in faster heating, faster cooling and better physical properties in the material being annealed.

To provide the greater amount of heat input required for this faster processing, these furnaces are equipped with "O" type radiant firing tubes. Fuel economies of at least 15% result from the use of this new type of firing tube.

PATENT No. 2,485,995

Lee Wilson

ENGINEERING *Co., Inc.*

20005 WEST LAKE ROAD • CLEVELAND, OHIO

Telephone ACademy 4670

INDUSTRIAL FURNACES ★ RADIANT TUBE HEATING ★ HEAT TREATING PROCESSES

SEVEN big money-making benefits for you...

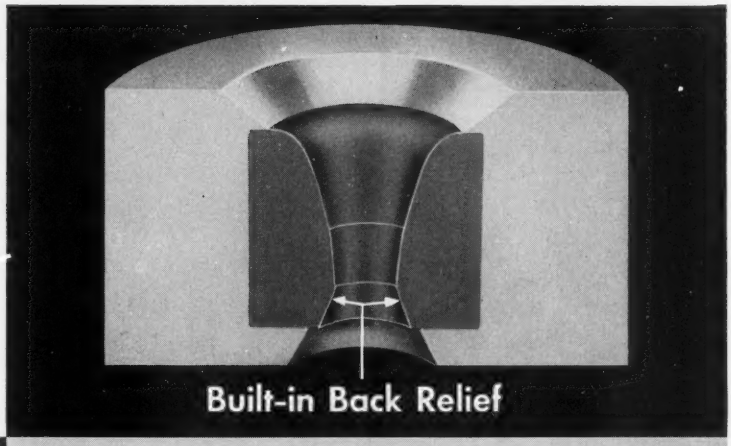
from

CARBOLOY ROUGH CORED DIES

WITH

BUILT-IN BACK-RELIEF

and other improved features



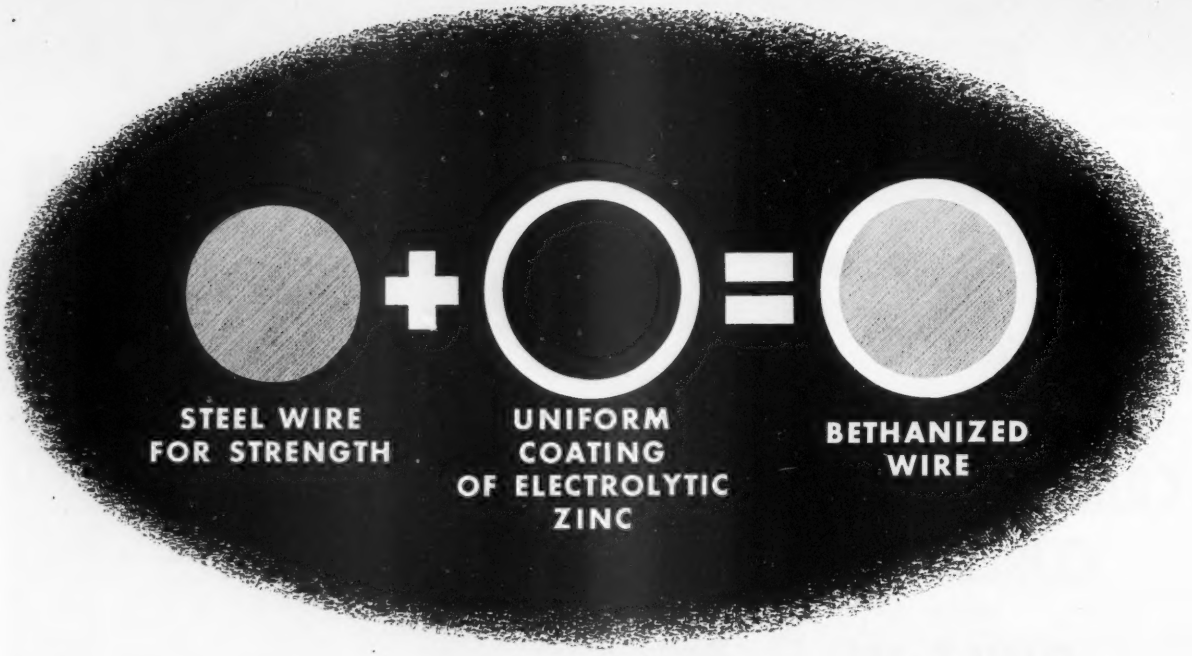
1. Saves Time When Making New Dies—eliminates cutting back-relief.
2. Reduces Labor When Resizing Dies—eliminates cutting back-relief.
3. Insures Correct Back-Relief At All Times.
4. Eliminates Die Failure Due To Incorrect Back-Relief.
5. Saves Diamond Powder and Perishable Supplies.
6. Increased Die Life due to higher nibs (R-1 to R-6).
7. Rough cored dies R-3, 4, 5 and 6 in some popular sizes now require less finishing time. Former hole size .065″ now .055″ and .090″ now .085″.

CARBOLOY COMPANY, INC.
11171 E. 8 Mile Street, Detroit 32, Michigan

PLUS

The Carboloy Company developed hot forged casing process —providing maximum support of the nib at the top, side and bottom, substantially increasing both the transverse and longitudinal strength of the nib.

CARBOLOY®
CEMENTED CARBIDE



Bethanized Wire

solves Forming and Corrosion Problems

The coating uniformity of bethanized wire is made possible by the electrolytic deposition of zinc, atom by atom—both around and along the wire. Here's the kind of protection you can really depend on for corrosion-resistance.

Ductility is another important feature. The zinc coating withstands the most severe forming operations because the 99.9-pct-pure zinc provides maximum ductility. Coating bond is a big advantage, too. The zinc armor is so tightly locked to the steel wire that you can twist it, bend it, wrap it, or even draw it through dies to fine gauge without cracking or peeling the zinc.

Bethanized wire has been used extensively for more than 15 years. Our backlog of orders is ample evidence of the satisfactory results it is giving in hundreds of different uses. Let us work with you in developing better wire products made of bethanized wire.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

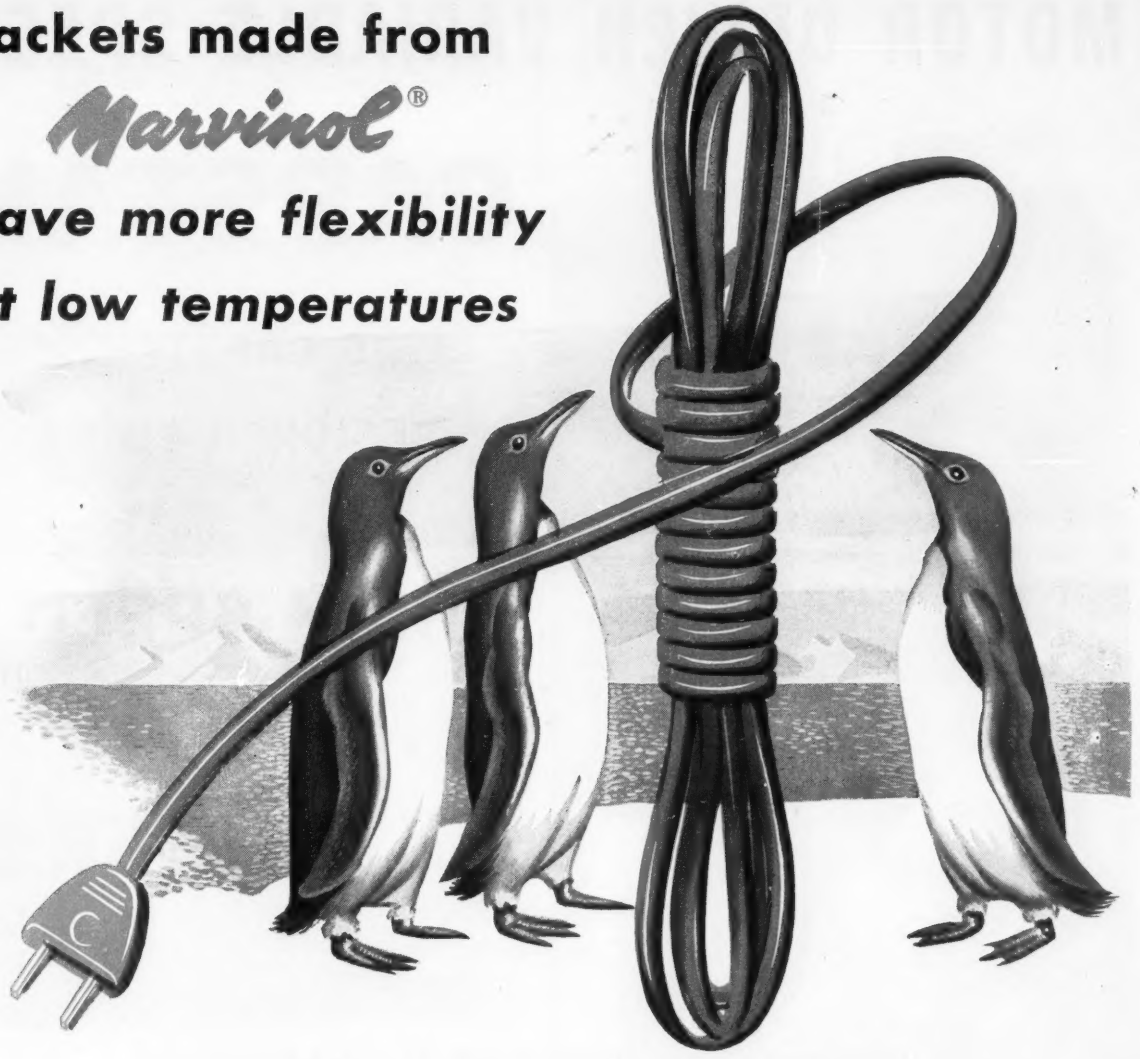
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export Distributor: Bethlehem Steel Export Corporation

WIRE & WIRE PRODUCTS, Vol. 24, No. 12, December, 1949. Publication Office, at One Sherman Ave., Jersey City 7, N. J. Executive Office, 300 Main Street, Stamford, Conn. Published monthly by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Secy. and Treas. Subscription price: U. S. $5.00; Canada, $5.00 per year; 50 cents per copy; Foreign, $7.50 per year. Entered as second class matter, January 10, 1949, at the Post Office, Jersey City, N. J., under Act of March 3, 1879.

Jackets made from Marvinol®

have more flexibility at low temperatures



. . .and in coats and jackets for wire, flexibility at low temperatures is important. But Marvinol's characteristics are just as outstanding under heat . . . there's less deformation with Marvinol VR-10.

Marvinol-based wire coats and jackets are drier, tougher . . . with better resistance to "cut-through," abrasion and the destructive forces of light, aging, oils and acids.

Marvinol extrudes faster. It saves time in compounding and mixing because of shorter pre-mix, open-mill and Banbury cycles. If you do not do your own compounding, let us show you how you can save money by performing this operation right in your own plant.

The Glenn L. Martin Company makes and sells Marvinol vinyl resin as a raw material to processors. It compounds and fabricates only in modern customer service laboratories for your benefit. So if you extrude insulation or jackets over wire and want information . . . or if you use insulated wire and want the name of someone now using Marvinol vinyl resin, write to Chemicals Division, Dept. W-12, The Glenn L. Martin Company, Baltimore 3, Maryland.

MANUFACTURERS OF: Dependable Martin 2-0-2 airliners • Advanced military aircraft • Revolutionary rockets and missiles • Electronic fire control systems • Versatile Marvinol resins (Martin Chemicals Division) • **DEVELOPERS OF:** Mareng fuel tanks (licensed to U.S. Rubber Co.) • Stratovision aerial re-broadcasting (in conjunction with Westinghouse Electric Corp.) • Honeycomb construction material (licensed to U.S. Plywood Corp.) • New type hydraulic automotive and aircraft brake • Permanent fabric flameproofing • **LEADERS IN RESEARCH** to guard the peace, build better living in far-reaching fields.

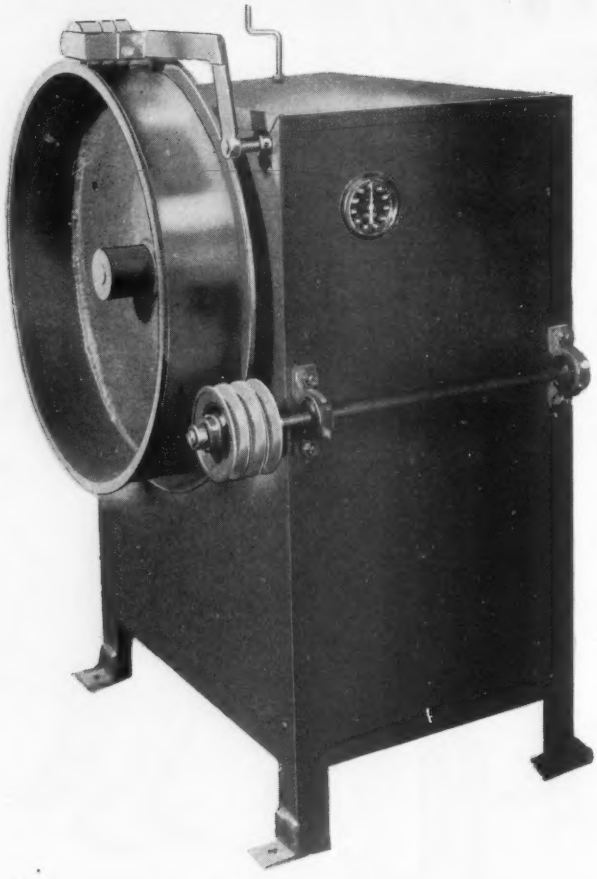
Martin Marvinol

RESINS, PLASTICIZERS AND STABILIZERS PRODUCED BY THE CHEMICALS DIVISION OF

THE GLENN L. MARTIN COMPANY • AN INTERNATIONAL INSTITUTION

"BETTER PRODUCTS, GREATER PROGRESS, ARE MADE BY MARTIN"

MOTOR DRIVEN VARIABLE SPEED



CAPSTAN

THIS CAPSTAN IS DESIGNED TO BE USED WITH HIGH SPEED PLASTIC EXTRUDERS

A polyphase motor drives a variable speed unit with a ratio of 16-1, which will give a range of 75 feet minimum to 1200 feet per minute maximum. The maximum speed can be increased to 1800 feet per minute which will give a minimum of 115 feet per minute. It's fast!

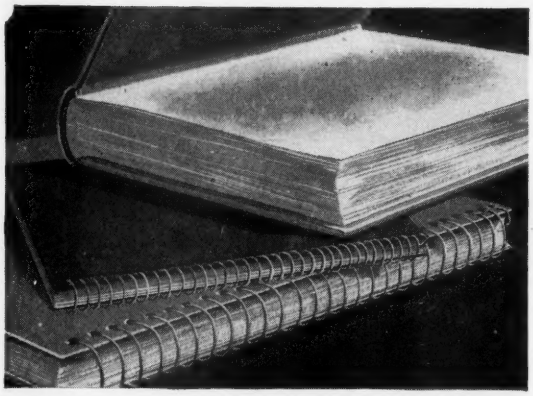
Write us today for detailed information!

DAVIS EQUIPMENT

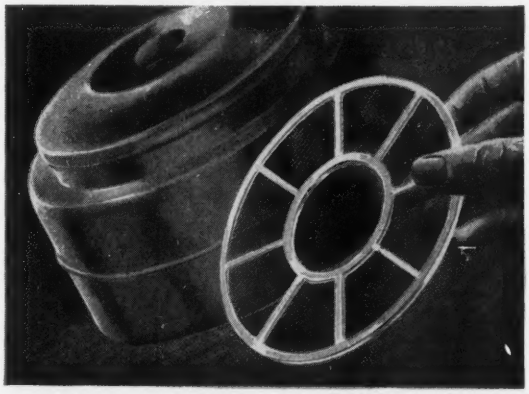
THE R. L. DAVIS ELECTRIC CO., INC. • WALLINGFORD, CONN.

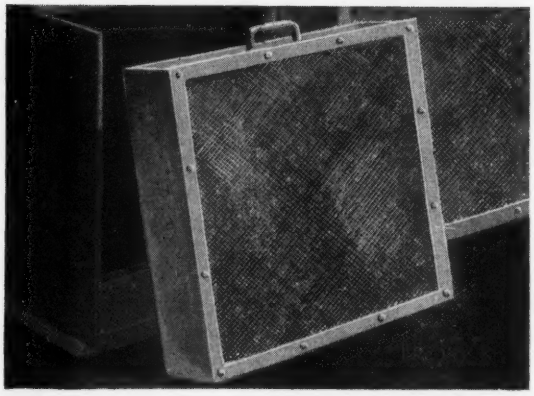
SPARK TESTERS • SPOOLERS • TAKE-UPS • CAPSTANS

U·S·S Amerfine

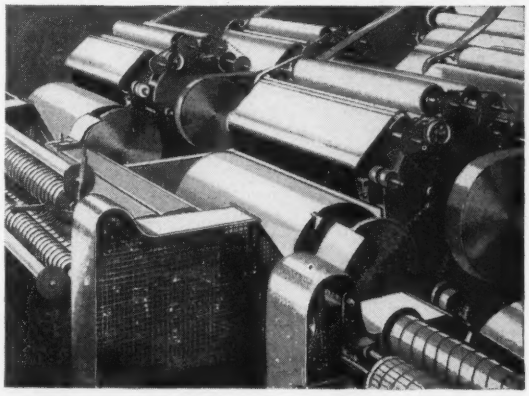


. . . for little jobs





. . . or large



U·S·S AMERFINE is a versatile wire that can be tailored to meet your needs exactly . . . whether you need wire for binding books or for carding textiles . . . whether you make air filters or wire screens. Whenever your product calls for a really fine wire, use AMERFINE.

Bring your wire problems to us. Our engineers and wire craftsmen will see that you get the proper grade of Amerfine. And we can supply AMERFINE NOW — in the mill quantity you need.

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If you use fine wire . . . use

Amerfine

USS

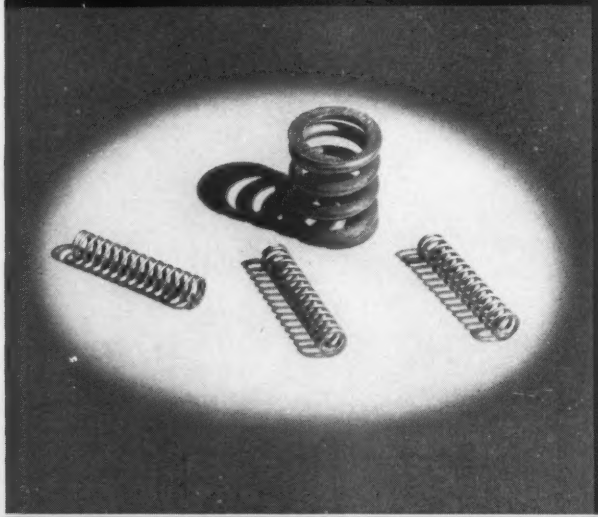
UNITED STATES STEEL

Cost Conscious?

Here's one sure way to reduce spring grinding costs . . *Specify* NORTON Discs!

Automotive Valve Springs

Grinding both ends of automotive valve springs on double-disc grinders is a typical production spring grinding operation which calls for discs of exactly the right specifications. Reports from many plants handling this operation prove that quality can be maintained — production increased — and costs lowered—with fast-cutting 57 ALUNDUM Discs (vitrified bonded, porous type, 57A246-L11VBEP).



Stainless Steel Springs

Another difficult spring grinding job—the grinding of heat-sensitive stainless steel springs—may be handled quickly and economically with cool-cutting Norton Discs of the sensational 32 ALUNDUM abrasive—32A36-K11VBEP.

Why not take advantage of the cost-cutting features of Norton discs and put them to work on each of your spring grinding jobs? They're available in all standard sizes (15" to 53" in diameter), and with all standard types of mountings.

Norton Company • Worcester 6, Mass.

Distributors In All Principal Cities
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"ALUMINUM LASTS"

These words *MOVE* your wire goods

Can salesmen pick your product and say, "This One's Aluminum—it will last for years!"

Sales advantages like this are easy to predict in wire goods made from Alcoa Aluminum Wire.

Want lightness—strength—corrosion resistance—workability? One of Alcoa's many wire alloys will exactly fit your needs. Let your nearby Alcoa salesman tell you more about this easy-forming wire that eliminates finishing—goes three times further pound for pound than heavy metals.

Learn all about Alcoa Aluminum Wire from the free book, "Alcoa Aluminum and Its Alloys." Ask your local Alcoa sales office for a copy or write direct. ALUMINUM COMPANY OF AMERICA, 1828M Gulf Building, Pittsburgh 19, Pennsylvania.

Send for copy of "Alcoa Aluminum and Its Alloys", complete information and data on all Alcoa Aluminum Alloys.

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ALCOA ALUMINUM

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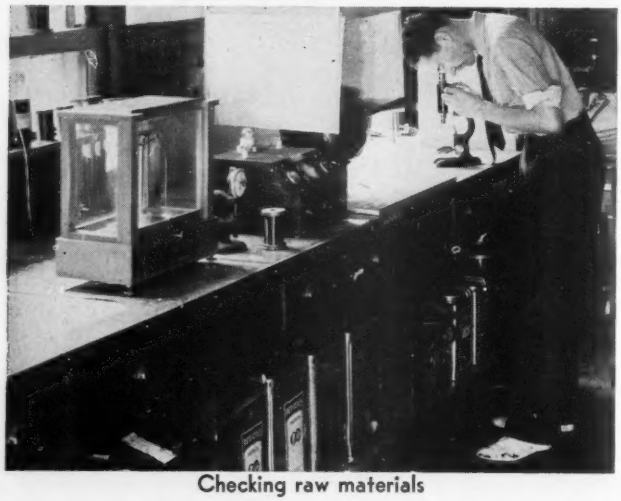
Custom built spools for high speed winding

Mercury testing for continuity of film



Checking raw materials

Don't "fool around" . . . USE DEPENDABLE WIRE PRODUCTS!

A product, too, is only as strong as its weakest part. Follow the practice of leading designers and engineers by specifying only service-giving wire . . . wire that has built up a reputation for "delivering the goods under fire."

Hudson Wire products, designed for discriminating manufacturers, has just such a reputation in the fine wire field. Offering greater flexibility and tensile strength, perfect laying at higher speeds, new coating methods and reduced coil dimensions without sacrificing electrical values. Hudson Wire products will probably lower your production costs considerably. Check these three points:

QUALITY — All phases of manufacture, from ingot to final processing, are carefully supervised and fulfilled in the same manner you would carry out in your own plant. There are no unimportant phases in the work.

UNIFORMITY — By mercury process tests, our engineers can guarantee perfect uniformity in wire; from the smallest to the largest order. No more variations in consistency, structure or electrical properties . . . every inch of wire exactly as specified, more than meeting your requirements.

SERVICE — If you have a wire problem, our complete design and engineering facilities are at your disposal without obligation. Send your specifications and blueprints for our recommendations; or if you are not quite ready, write for samples of these quality products.

Enameled Copper, Enameled Iron, Enameled Alloy, Enameled Aluminum, Silk Covered, Cotton Covered, Celanese Covered, Glass Fibre Covered, Twisted Multiples, Parallel Multiples, and Litzendraht

HUDSON WIRE CO.

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WINSTED CONNECTICUT

Meet your

SWIFT SOAP TEAM

We're READY with quality soaps for every wire drawing need! You can always find the right soap for the job in Swift's complete line. Whatever your specialized need, Swift's Soap Department can fill it. And you'll find that Swift's Soaps for wire drawing uses have efficient lubrication, minimum dusting and dependable uniform quality. You can't buy finer soaps anywhere.

WILLING to help solve tough wire drawing lubrication problems!

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Call SWIFT first for soaps

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Powdered White Ribbon *Guaranteed Powder*

Snap Heavy Duty Wire Drawing Powder No. 282

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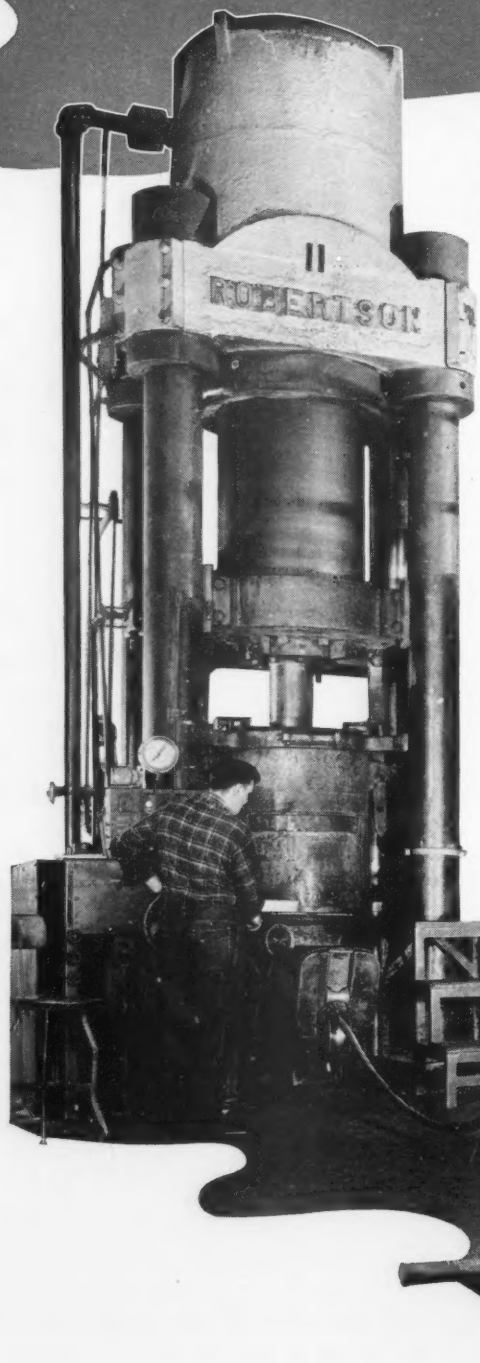
Consistent, low-cost production

...WITH ROBERTSON CABLE LEAD ENCASING PRESSES



To help produce vital power and communication lines throughout the world, leading manufacturers of wire and cable employ Robertson High Pressure Hydraulic Presses. They know that, year in and year out, Robertson Equipment stands up under the most severe production schedules—assuring lower operating and maintenance costs, and consistently producing a uniform product that invites customer satisfaction . . . If you have a lead encasing problem, we will be glad to help you in any way possible. Consult our experienced engineers without obligation.

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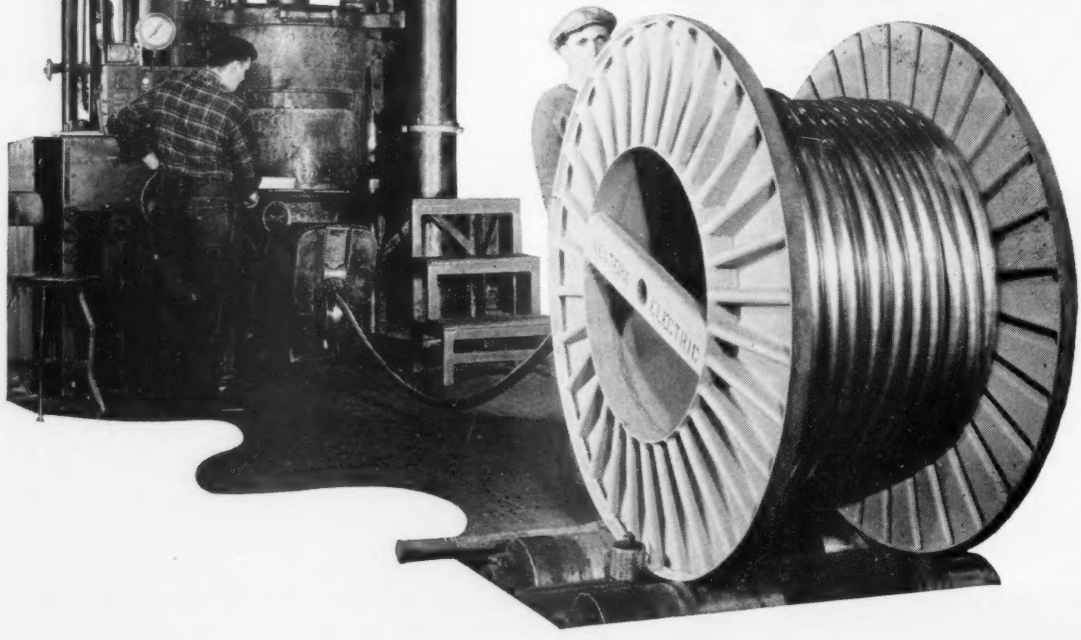
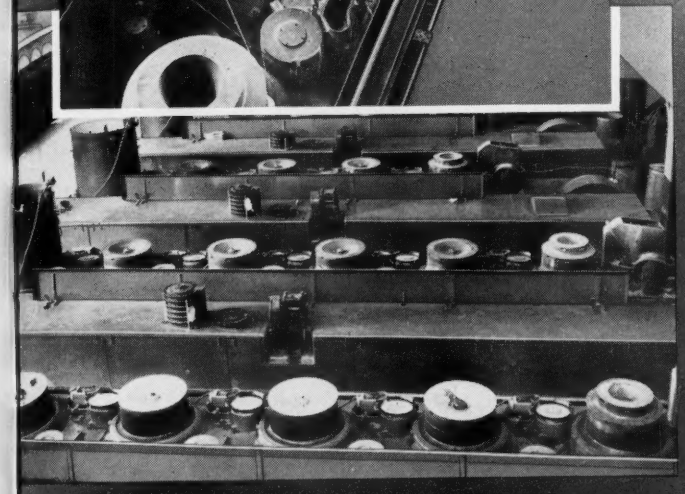
COMPANY, INCORPORATED
125-137 WATER STREET, BROOKLYN 1, NEW YORK
Designers and Builders of all Types of Lead Encasing Machinery
Since 1858

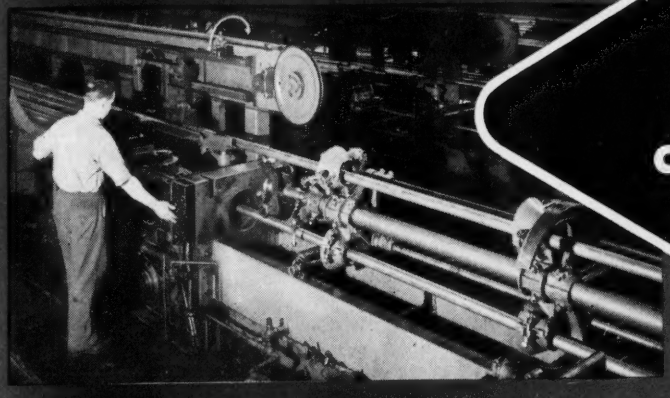


How to

STRETCH

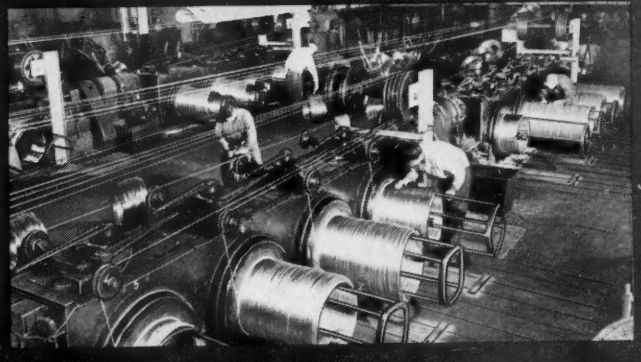
Production Dollars!





Vaughn

COLD DRAWING MACHINERY



Vaughn Machinery makes metal *and money* go farther in your cold drawing operations. Cost-cutting efficiency in performance, economy of maintenance, and built-in durability are the basic reasons why. *May we discuss your requirements?*

THE VAUGHN MACHINERY CO.

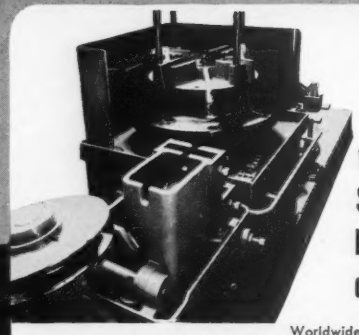
CUYAHOGA FALLS, OHIO, U. S. A.

COMPLETE COLD DRAWING EQUIPMENT — Continuous or Single Hole . . . for the Largest Bars and Tubes . . . to the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.

"Good On the Draw"
VAUGHN MACHINERY
Pioneers, Built by Leaders
Since Nine Nine 1871

Slash operating expenses

...with versatile ..... double deck...



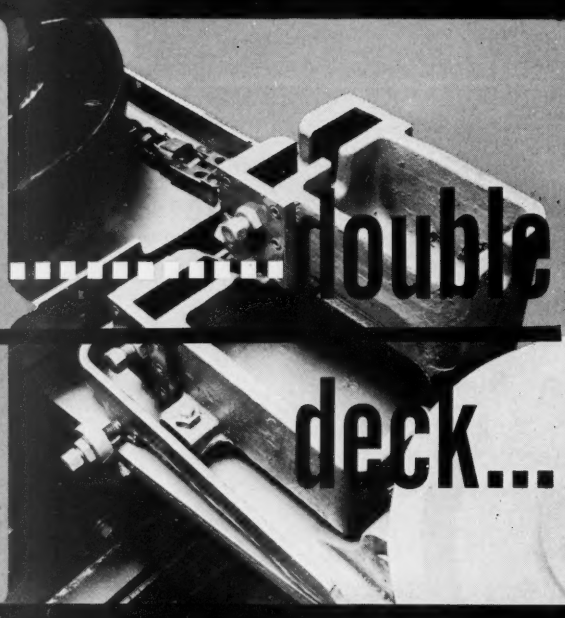
for SINGLE or DOUBLE HOLE drawing...

Worldwide interest and praise of the superiority of this double-deck, single or double hole drawing, rod-block is fast being shown, because of the revolutionary mechanical operating efficiency of these newest features offered only by SYNCRO. The installations of these machines (whose blocks are driven by a CONE WORM DRIVE of highest, rugged-lasting, engineering performance) will definitely assure you of a profit-making "jump ahead" of your many competitors.

Wide-awake wire and rod drawing manufacturers readily attest to their re-established position in domestic and world markets through the employment of this specially improved SYNCRO equipment. If it's profits you want - with loads up to 125 h.p. - a simple inquiry on your letterhead will give us an opportunity to tell you (better than here) facts, which at no obligation to you, will definitely show you WHY this machine will make more money for you than others on the market!

NOTE: Double-deck blocks can also be furnished to accommodate G-E patented shaving head.

SYNCRO MACHINE CO
PERTH AMBOY • NEW JERSEY • USA

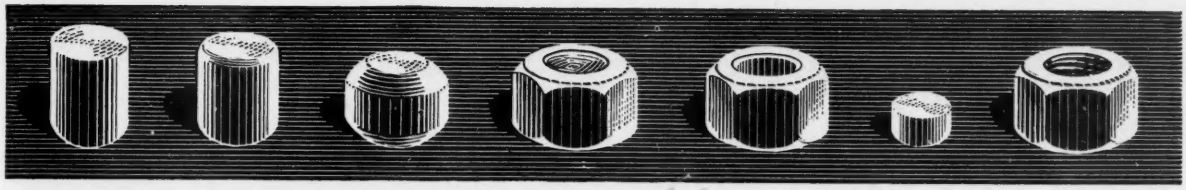


RODBLOCKS

Eliminating:

★ LOST POWER ★ INACCESSIBILITY ★ COMPLICATED STRINGING ★ COSTLY SHUT-DOWN TIME ★ RE-POSITIONING OF DIE BOXES ★ OPERATOR HAZARDS AND FATIGUE ★ COMPLICATED ELEVATING MECHANISMS ★ WASTED INSTALLATION HORSEPOWER SPACE ★ INEFFICIENT WORM-GEAR DRIVES

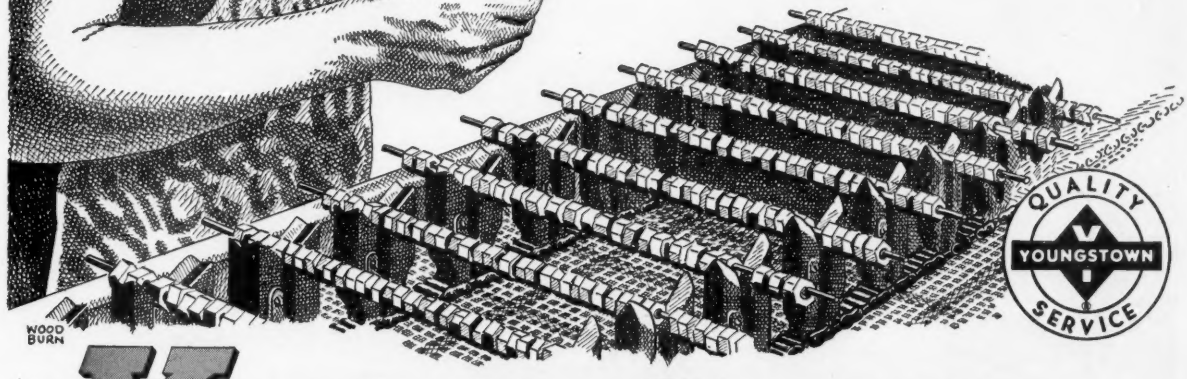
AFFILIATED COMPANY • WINGET-SYNCRO, ROCHESTER, KENT, ENGLAND



For Minimum Rejects

FROM first to last, nuts formed from Youngstown Scrapless Nut Quality Wire stand strict inspection--by magnetic particle or the usual visual inspection methods. That's because Youngstown Scrapless Nut Quality Wire comes to you so free from piping, seams, laps, die marks, internal tearing and cupping and nonmetallic inclusions.

Available in various compositions including AISI standard as well as special sulphurized steels.---Cold heading bolt wire, of comparable quality, in all standard carbon analyses available for prompt shipment to the bolt and nut industry.



Youngstown

SCRAPLESS NUT QUALITY WIRE

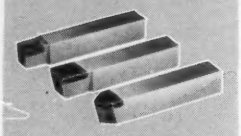
THE YOUNGSTOWN SHEET AND TUBE COMPANY General Offices — Youngstown 1, Ohio

Manufacturers of Carbon, Alloy and Yoloy Steel Export Office-500 Fifth Avenue, New York

WIRE - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - PIPE AND TUBULAR PRODUCTS - HOT AND COLD FINISHED CARBON AND ALLOY BARS - RODS - SHEETS - PLATES - CONDUIT - RAILROAD TRACK SPIKES.

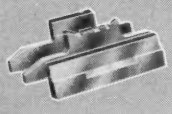
50 TIMES MORE TONNAGE *plus*

TALIDE METAL MEETS EVERY REQUIREMENT



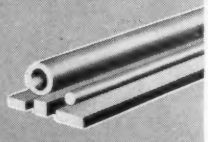
CUTTING TOOLS

DRAWING DIES



CENTERLESS BLADES

DRILL JIG BUSHINGS



SOLID BAR STOCK

Talide
(TUNGSTEN CARBIDE)
Work Rolls

1. MORE PRODUCTION
2. HIGHER SPEEDS
3. LESS DOWNTIME
4. CLOSER TOLERANCES
5. GREATER REDUCTIONS
6. FEWER REJECTS

Solid Carbide Rolls
(weighing up to 1000 pounds)
for Strip or Sheet

Mills report astounding tonnage figures with carbide rolls. In addition to increased operating speeds, improved surface finish makes subsequent polishing and buffing unnecessary.

Tungsten Carbide Rolls can be used for ordinary finish or mirror-finish on such items as cold rolled stainless, spring steel, razor steel, alloys, carbon, aluminum foil, tinsel ribbon and flat wire.

Solid or sleeved, carbide rolls are an exclusive development of Metal Carbides Corporation. Available in diameters up to 10″ and lengths up to 40″.

Write today for Talide Roll Circular which gives particulars on how to obtain more production, higher speeds, less downtime, closer tolerances, greater reductions and fewer rejects on your mill operations.

Sleeved Rolls for Flat Wire ———— *For Shape Wire*

SINTERED CARBIDES
METAL CARBIDES CORPORATION
TALIDE
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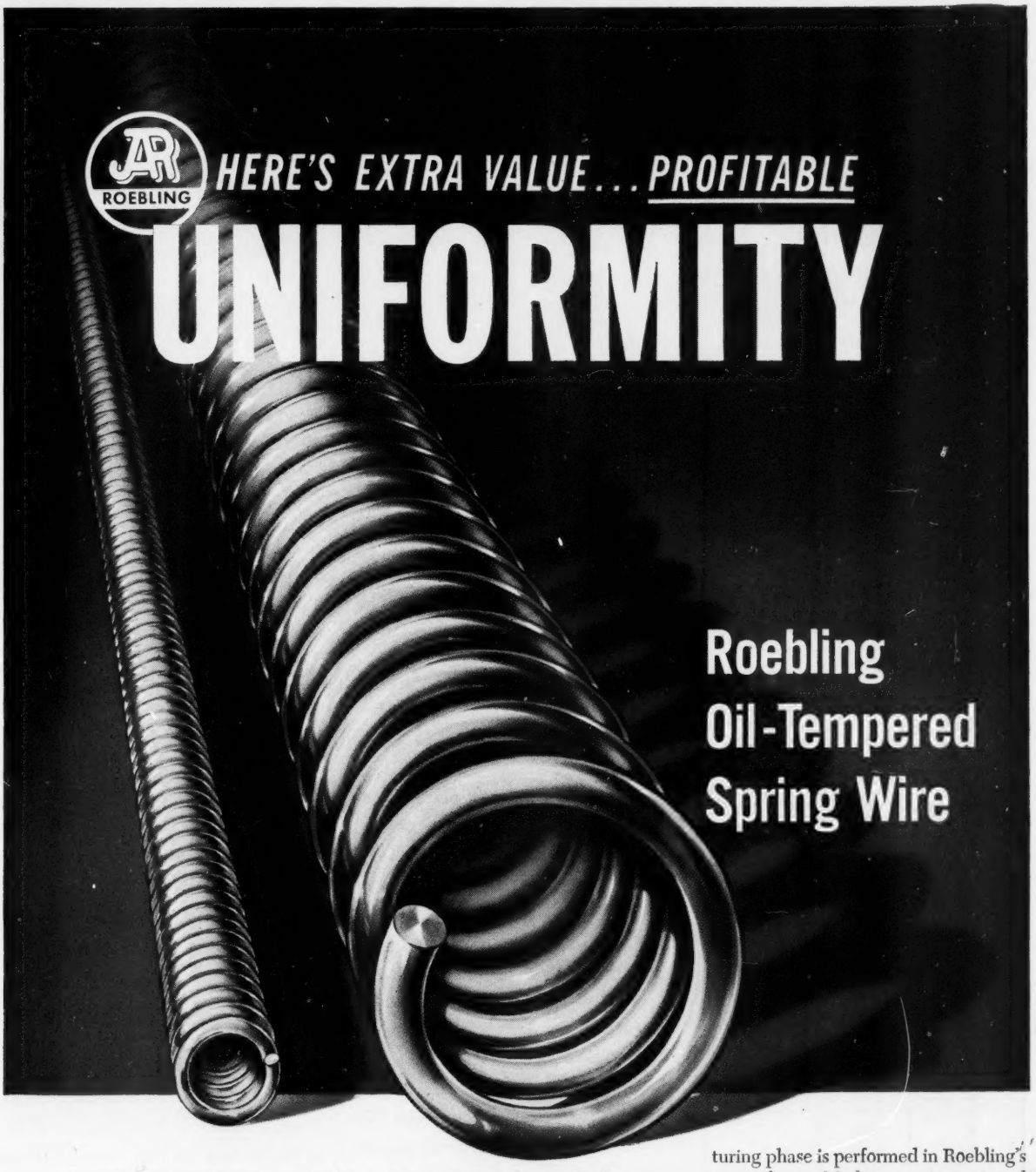

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PRODUCTION GOES INTO HIGH with Roebling Oil-Tempered Spring Wire. Every inch is just like every other inch . . . same gauge and grain structure . . . same strength, hardness and finish. And more than that, the dependably uniform analysis of Roebling Spring Wire enables you to maintain your specified quality standards without variation.

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Your Roebling Field Man will be glad to help you select the right wire—round, flat or shaped—for top performance and economy in your own products. John A. Roebling's Sons Company, Trenton 2, New Jersey.

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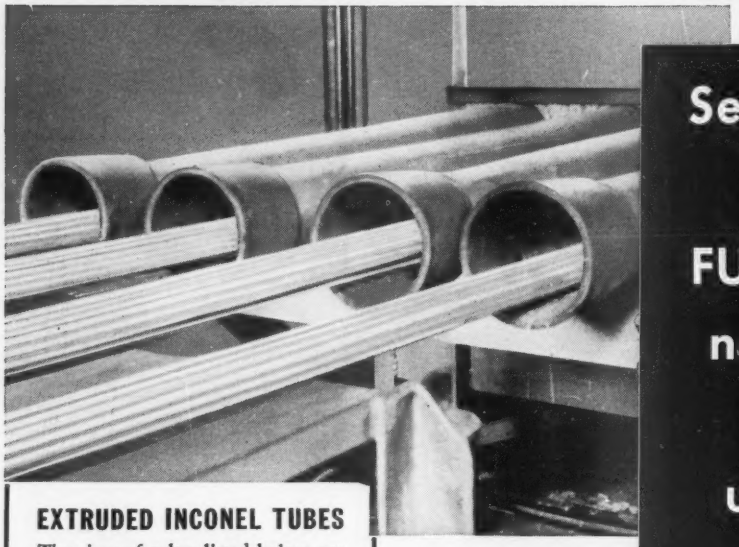
Important News:



Seamless extruded INCONEL FURNACE TUBING now available in large sizes... up to 8½" O. D.

Annealing furnace for treating welded alloy tubing, installed at the plant of the Metal Forming Corp., Elkhart, Ind. INCONEL *tubing shown is 5-9/16 in. with 1/4 in. wall. The furnace operates continuously, 24 hours a day, 7 days a week. A hydrogen-nitrogen atmosphere is used. Temperatures range 1450° to 2000° F., and from these* INCONEL *tubes, the Metal Forming Corp. has received over 11,000 hours of service life.*

EXTRUDED INCONEL TUBES

The sizes of tubes listed below are those which can be produced from tools regularly carried in stock. Other sizes of extruded tubes can be produced on individual order.

O.D.	Wall	Maximum Length
2-1/2"	5/16"	11' 3"
3-1/4"	1/4"	—
3-1/4"	5/16"	17'
3-1/4"	3/8"	14' 3"
3-1/4"	1/2"	12' 6"
4"	1/4"	22'
4"	5/16"	18'
4"	3/8"	15' 3"
4"	7/16"	13' 3"
4"	1/2"	11' 9"
4"	5/8"	8'
4-1/2"	3/8"	13' 3"
4-1/2"	1/2"	10' 3"
4-1/2"	9/16"	9' 3"
4-1/2"	5/8"	8' 6"
5"	1/4"	—
5-9/16"	1/4"	—
5-9/16"	3/8"	14' 3"
5-9/16"	1/2"	11' 3"
5-9/16"	9/16"	10'
6"	1/4"	—
6"	3/8"	12' 6"
6"	1/2"	10'
6"	5/8"	8' 6"
6-1/2"	1/4"	—
6-1/2"	3/8"	11' 3"
6-1/2"	1/2"	8' 6"
6-1/2"	5/8"	7' 3"
7"	1/4"	—
7"	3/8"	10' 3"
7"	1/2"	8'
7"	5/8"	6' 6"
7-1/2"	1/2"	9' 9"
7-1/2"	5/8"	6'
8"	3/8"	11' 9"
8"	1/2"	9'
8"	5/8"	7' 6"
8-1/2"	3/8"	—
8-1/2"	1/2"	—
8-1/2"	5/8"	6' 9"

NOW you can have all the special advantages of INCONEL* *plus* the advantages of seamless, extruded tubing . . . for large as well as small installations.

Here's why!

INCONEL—the heat-resistant, corrosion- and oxidation-resistant INCO Nickel Alloy—is now being extruded in tubing with outside diameters of all the way from 2½ to 8½ inches. Wall thicknesses range from ¼ to ⅝ inches.

Just glance at the table. With such a variety of sizes at your command, you can meet almost any furnace design requirement. Remember, too, that special lengths and dimensions can often be produced to fit specific conditions. You can get INCONEL in standard mill forms, as well as tubing.

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INCONEL*—FOR LONG SERVICE AT HIGH TEMPERATURES

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You'll agree that holding wire to a tolerance of one ten-thousandth of an inch and furnishing such wire commercially in a size as fine as .003, calls for extremely accurate dies and skilled craftsmanship. And, while we at Wickwire make all kinds of steel wire, our reputation is built upon this and other types of specialty wires that must have high, uniform quality, perfect surface and close tolerance.

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A PRODUCT OF WICKWIRE SPENCER STEEL DIVISION · THE COLORADO FUEL AND IRON CORPORATION
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CF&I

WHEW!

We Certainly Started Something in the STAINLESS STEEL Field!

WE KNEW you would be interested in our new method of drawing stainless steel wire without lead, but your enthusiastic reception of this new process has almost bowled us over.

Those mills which have already installed this new process are counting up their blessings . . . and their increased profits, too.

Think of it . . . in "Sixty Secret Seconds" after the rod is cleaned of scale, it is prepared for the coating, and *nine minutes later* it is ready for drawing. Just imagine, if you can, the saving in time alone, which reflects itself in output and cost of finished wire. Beautifully finished, too, we might add.

When intermediate annealing is required, there is *nothing* to remove from the metal. Here is another time-consuming operation eliminated. And after annealing, all you need to do is repeat the same ten-minute operation and continue drawing.

The right lubricant is of *utmost* importance on stainless steel. Our Magnus Dri-Draw #4 was "tailored" to fit Metalcoat #267, and for wet drawing, there is nothing to equal our Magnus Wet-Draw #42 for smooth, lustrous finish.

We'll be glad to tell you what goes on during those "Sixty Secret Seconds." Just write us.

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Metal Coating Division

MAGNUS CHEMICAL CO., INC.

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A Revolutionary New Method of Handling and Storing Rod & Wire

100 or more different sizes and alloys can be easily stored and reached in a warehouse with this new grab and carrier. Every stack is visible to the crane operator and can be reached at a moment's notice.

Threading hook into rod in horizontal position.

Hoisting and turning to vertical position.

Cleveland Tramrail Development Enables Compact Vertical Piling

Rod and wire can be stored in closely spaced vertical piles 20 or more feet high. Separation of various sizes and alloys can be easily maintained. Warehouse storage capacity can be increased approximately 25%.

These and other features are made possible by a new Vertical Stacking Hairpin Hook and Carrier developed by Cleveland Tramrail—the greatest advancement in materials handling for the Wire and Rod Industry since the introduction of the original hairpin hook carrier (also a Cleveland Tramrail development) 25 years ago.

The new vertical stacking hook will handle 10 standard coils of 330 lbs. each, or 3300 lbs. total, at a time, picking them from horizontal position on the floor or in gondola car and placing them in vertical piles supported by floor posts. The hook will also lift the coils from the vertical piles and place them into a horizontal position.

The grab mechanism is actuated by a built-in hydraulic pump which causes a spreader plate to expand or retract. In the expanded position, sufficient pressure is exerted against the inside diameter of the coils to hold them firmly during handling.

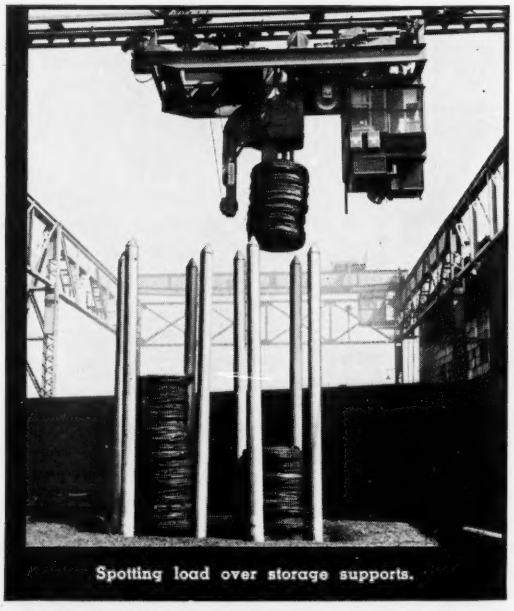
The first installation of the equipment has just been completed. It is in a building with a truss height of 40 feet. Rod will be stored to a height of 22 feet.

All motions of overhead carrier or crane and the hook are controlled from the crane operator's cab. If desired, the operator can maintain records in his crane cab of entries and withdrawals and thus keep a perpetual record of rod or wire in the warehouse.

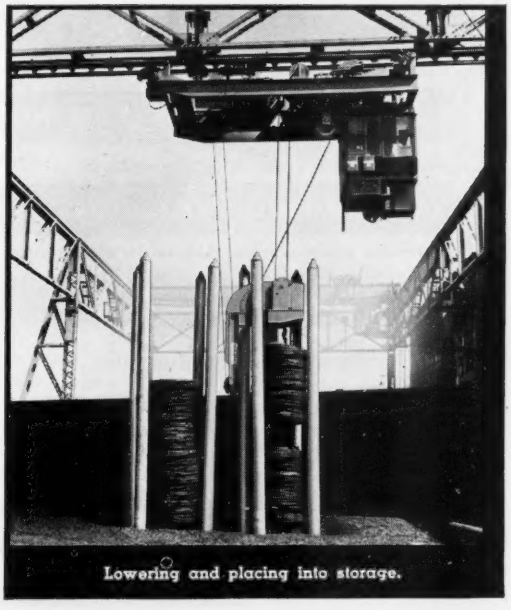
Let our engineers give you the details on how this outstanding development can improve your plant efficiency and cut costs.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
9214 EAST 288TH ST. WICKLIFFE OHIO

CLEVELAND TRAMRAIL



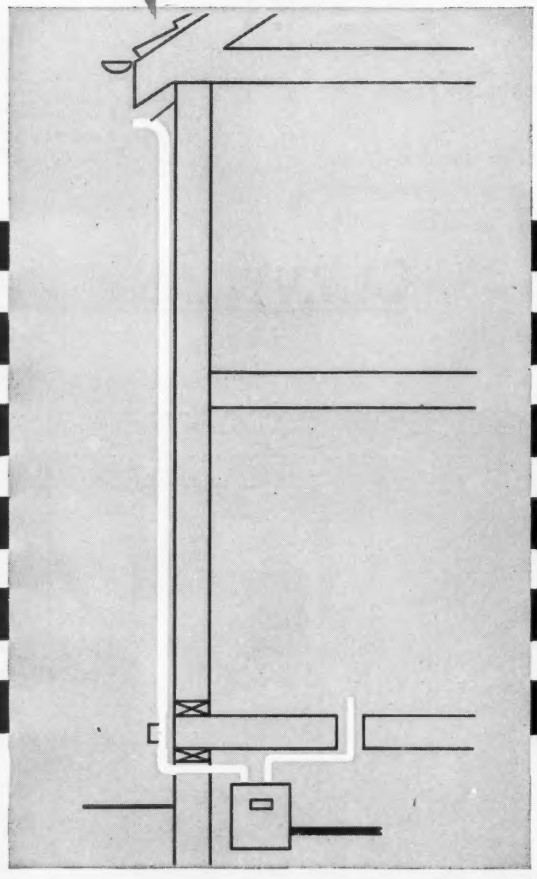
Spotting load over storage supports.



Lowering and placing into storage.

DO YOU KNOW

why tapes reinforced with FIBERGLAS YARNS are used for moisture seal in Service Entrance Cable?



FIBERGLAS* YARNS

- *WILL NOT ROT*
- *WILL NOT BURN*
- *WILL NOT ABSORB MOISTURE*
- *HAVE GREAT TENSILE STRENGTH*
- *MINIMUM SPACE FACTOR*

permitting maximum rubber thickness for plus-moisture resistance

- *LOW COST!*

For complete information about Fiberglas yarns for this and other uses write Owens-Corning Fiberglas Corporation, Textile Products Division, Dept. 875, 16 E. 56th Street, New York 22, N. Y.

OWENS-CORNING FIBERGLAS *Yarns*

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Hook-up wire jacketed with HEAT-RESISTANT DU PONT NYLON PLASTIC approved for temperatures to 90°C.

NEW NYLON-JACKETED WIRE

for Radio, Electrical and Electronic Devices

HEAT-RESISTANT nylon-jacketed wire, made by Gavitt Manufacturing Co., Brookfield, Mass., in two types: 1/64″ wall thickness with 300-volt rating, and 1/32″ wall thickness with 600-volt rating—both with 5-mil extruded nylon jackets.

Small diameter, light weight, and flexibility among the many *extra* advantages of nylon heat-resistant jackets

The first thermoplastic-insulated wire to receive Underwriters' approval for use in electrical appliances at temperatures to 90°C. is now being made by covering the wire with a jacket of Du Pont nylon plastic.

Only a thin coating of lightweight nylon is needed to provide this added heat-resistance, instead of the heavy asbestos jacket formerly used. Thus this wire has the advantages of *light weight, small diameter,* and *flexibility.*

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To help you make better products

Today, manufacturers of electrical wire are finding that a jacket of nylon reduces deformation under load at elevated temperatures, and they are using this property to help meet the increasing demand for heat-resistant wiring. Nylon can help you make many electrical products better. This Du Pont plastic can be extruded over bare wire or over primary insulation. It can be molded into thin sections and intricate shapes, and around metal inserts.

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E. I. du Pont de Nemours & Co. (Inc.), Plastics Department.

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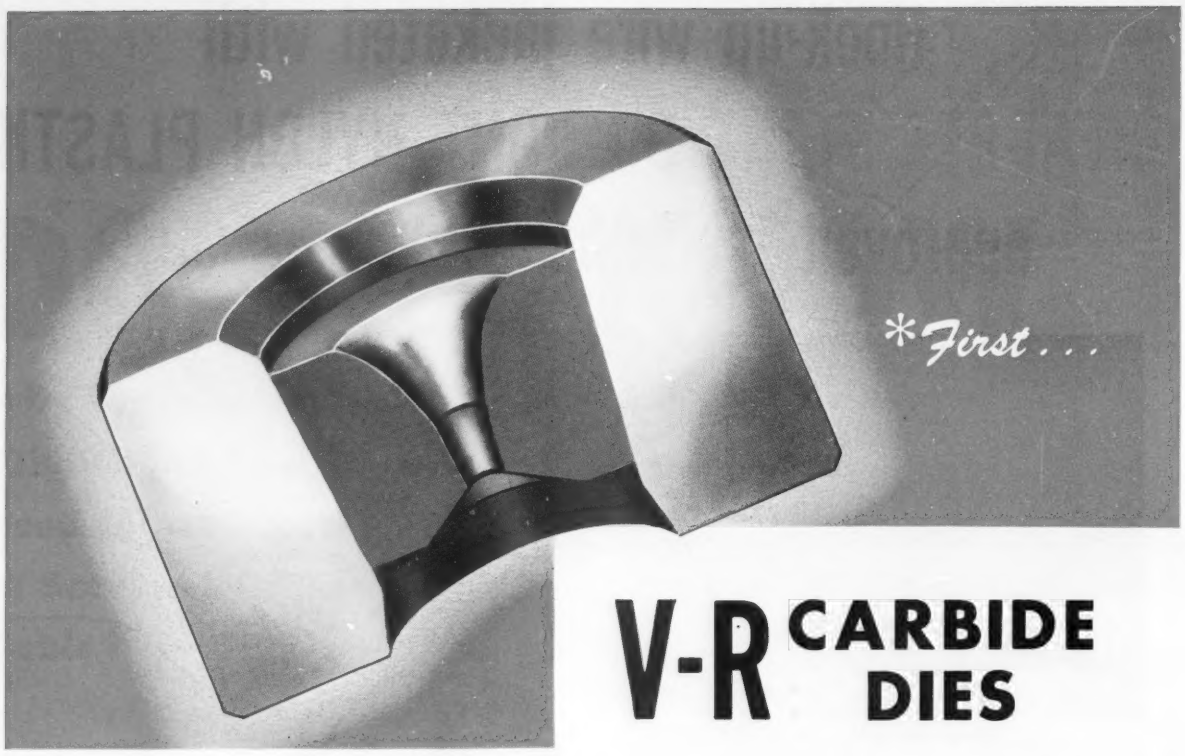
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY



V-R CARBIDE DIES

mean . . . high tonnage output at minimum cost

* First to develop extra wide tapered front and back openings for easy inspection and maintenance. No steel to cut when resizing or refinishing V-R Dies.

* First to design and develop the tapered nib construction increasing internal strength and providing perfect die concentricity.

* First to manufacture Carbide Die with preformed rough cored back relief to eliminate costly die room coring operations over the entire range of hole sizes.

* First to furnish Carbide Dies rough cored to finish, at hole sizes below .015". These rough cored dies are available in dies sizes R-O, R-1, and R-3, rough cored at .004" and .010".

V-R Carbide Dies combine every advantage known to the wire industry.

V-R Carbide Dies, R-1 thru R-6 with the NEW higher nibs are completely redesigned to improve drawing conditions and to allow for heavier drafting practice.

Eliminate unnecessary maintenance and cost NOW by changing to V-R Carbide Dies—The World's Finest!

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Your Nearest V-R Branch Office for Your Carbide Die Needs Now!

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V-R CARBIDE and TANTUNG

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The Wire Outlook

Just when the wheels of industry were about to grind to a halt, the steel and coal strikes were fortunately settled. From the enthusiastic manner in which the men went back to work, it is evident that the strikes were not popular with the rank and file. Nothing will ever make up the losses incurred, which once again demonstrate the futility of the strike as a weapon to settle disputes.

There has been a sharp upturn in steel production and it will take until next April or May for it to catch up with the demand. Eight or nine million tons of steel were lost. Industry lost its fight for the principal of contributory pensions and the result will profoundly affect all management-labor relations in the future as well as again conduce to higher price levels.

The settlement will probably slow down plant expansion programs, but will accelerate the demand for newer and more efficient capital equipment. A vast amount of industrial equipment is obsolete or badly worn and must be replaced to help offset the added costs of the new contracts.

While steel production will come back fast and operate at higher levels than before the strikes, mills are forced once more to allocate their outputs for a while to stretch out the available supply. Scrap has advanced in price in response to the greater activity. From the workers' standpoint it will no longer be as easy to quit a job or to get a new one—the price they must pay for their new so-called "security". Employers will not only have to assume heavy direct costs, but the enormous indirect expense involved in the paper work of handling the benefit details.

Steel exporters are not too optimistic about the possibility of shipping steel abroad for the next few months due to current shortages of steel. There has also been a resurgence of steel production abroad and cheaper competition as a result of currency devaluations. It is reported that considerable business already has been lost by domestic producers who sell in South America to British steel mills. This is a logical consequence of current conditions.

Copper and brass demand has risen sharply and electric wire and cable mills seem to have recovered from the severe slump of the first half, when buying came almost to a halt through the period of declining prices.

Through the strike some sizes of wire became short, but activity generally remained good because of a fair supply of rod stocks that most fabricators had built up beforehand. Merchant items, such as fencing are in fairly good supply. Wire mill bookings are growing. Nails are at present the tightest of the merchant items.

Bolt and nut makers, not effected too seriously by the strike, are getting more orders, but many have dropped to single shifts and will continue on that basis until greater supplies are available.

While we can all breathe more easily and can feel a sense of relief from the settlement of the disputes before our economy received too serious a set-back, there is little cause for rejoicing over the manner and result of its conclusions. The workers may be said to have won a Pyrrhic victory and industrialists given a permanent headache. The economic aspects of the settlement were too mixed with political factors to be sound and healthy.

However, business activity will rebound sharply and should be good through the first half of 1950—probably for three or four years. But who can say what the further future will bring while we have Lewises, Murrays and Trumans in the saddle. In the long run it is the ultimate consumer who pays for their excesses, this includes every man, woman and child in the country; yes—even labor?

— from the Editor's Desk

UPRIGHT ★ ★ ★

★ ★ ★ CONE

Wire Drawing Machines

FOUNDED WATERBURY FARREL 1851

THESE high speed machines are available in several sizes and can be had with either a coiling block or spooler. The spooler may be an attachment or a separate floor-type device, such as shown. This is the No. 4 machine with belt-type cradle spooler. It is driven by a direct-coupled motor (not shown), has 13 dies and capacity for drawing copper from ¼″ maximum starting size down to a finishing size of from No. 10 to No. 18 B. & S. gage. The dies and the hardened steel drawing rolls are enclosed by a rolling steel curtain to confine the splash of the drawing lubricant.

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FOUNDRY & MACHINE COMPANY
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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 24 DECEMBER, 1949 No. 12

Designated as

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Reg. 511,530 U. S. Pat. Off.

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— ASSOCIATE EDITORS —

Kenneth B. Lewis, Consulting Wire Mill Engineer

Lancaster, Allwine & Rommel, Consultants on Patent Information

Richard E. Brown, General Manager

R. S. Spengel, Business Manager

E. D. Sickels, Advertising Manager

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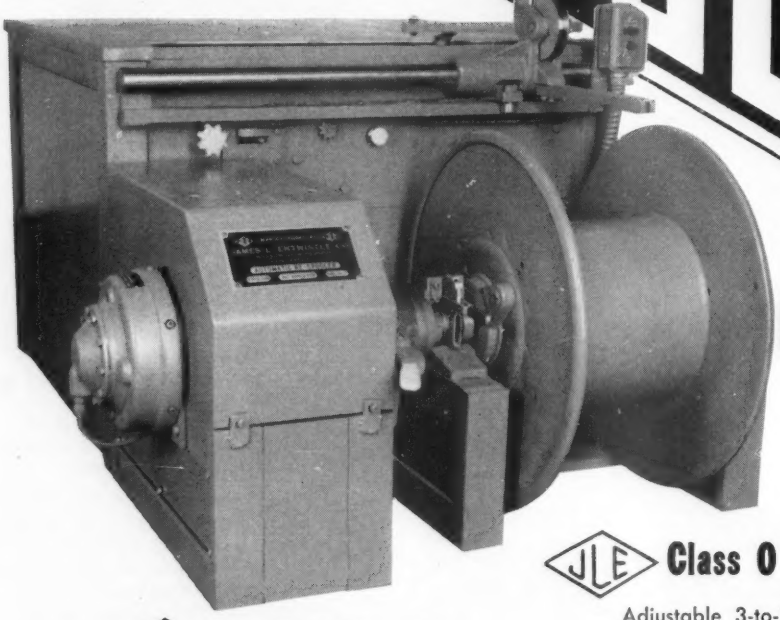

JLE Class O Re-Spooler

Individual Drive-Brake-and-Traverse Re-Spoolers

Gang winders are out of date! Replace them with JLE's new individual drive Re-Spoolers to improve the quality of your wire rope or strand through uniformly wound strander spools. You'll be astonished at the low cost of such high quality machines.

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Exact measurement of required wire length, *eliminating waste.*

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Each wire start can easily be made at spool flange.

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WIRE
AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 24 DECEMBER, 1949 No. 12

The Measurement and Control of Eccentricity in Insulated Cables

By Dr. V. Planer and Dr. F. E. Planer
London, England

A recent development in electronic measuring and control gear which aids cable manufacturers in producing truly concentric, insulated wires and cables by extrusion methods.

Introduction

ECCENTRICITY of the conductor relative to the surrounding dielectric in extruded wires and cables has until recently presented one of the major problems in the manufacture of cables by extrusion methods. There are a number of reasons which make it desirable to maintain accurate concentricity in insulated conductors. One of the most important is that a deviation of the conductor from its axial position in the dielectric lessons the insulation resistance and breakdown voltage, since the insulating properties of the cable depend on those of the thinnest film of the dielectric covering the conductor.

★ ★ ★

ALTERNATIVELY, if a given dielectric strength is taken as the criterion in manufacture, eccentricity of the conductor leads to wastage of insulating material, since the overall diameter of the cable will have to be increased to take into account the probable degree of eccentricity. An examination of the cross-sections of samples selected at random of extruded rubber, polyvinal-chloride and polythene insulated cables, as they are in current use in production departments and laboratories, will usually reveal a considerable percentage of eccentrically extruded conductors, indicating the urgency for more effective production methods. It will be apparent from this that the quantities of insulating material required additionally to safeguard against the effects of deviations of the conductor are appreciable, and the resulting wastage, especially in cases where raw materials of relatively high initial cost, such as polythene, are used, has an important bearing on the cost of the product, quite apart from the many lengths of extruded cables which fail to pass production tests due to excessive eccentricity and thus never reach the consumer.

★ ★ ★

ANOTHER undesirable result of eccentricity is the electrical coupling that it may cause in balanced lines. Thus, deviations of the individual conductors in four-core telephone cables, for instance, are frequently the cause of cross-talk.

★ ★ ★

IN very high frequency lines eccentricity may result in impedance variations and high attenuation due to reflections.

★ ★ ★

Causes of Eccentricity and Existing Methods of Control

IN the extrusion process the plastic insulating material is forced at an elevated temperature into a cavity by means of a revolving screw; from this it issues through the circular orifice formed by the die. At the same time the uncoated conductor is fed into the cavity and guided through the die which it leaves coated with the still plastic material. Depending on the type of dielectric employed the coating may harden sufficiently rapidly for the wind-up drum to follow directly upon the extruding machine. Alternatively, artificial means, such as water jets, may be employed to hasten the setting process. In the case of rubber coating machines, a continuous vulcanization process frequently follows the extruder, or else the cable is stored on special drums which are subsequently transferred to vulcanization chambers.

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ECCENTRICITY of the conductor, which may be due to a number of factors, can arise at various stages of the manufacturing process. A frequent cause is undue tension applied to the cable by the winding-up drum when it is attempted to increase production by raising the speed of extrusion. With an insufficiently hardened coating, radial tension applied to the cable tends to cause displacements of the conductor towards the centre of the drum. Another cause of eccentricity is the pressure exerted by the weight of the cable itself when this is stored on drums with the coating still in a semi-plastic condition. With due care and a thorough knowledge of the properties of the various insulating materials and compounds used, it is generally possible to avoid failures due to the above causes. This may be greatly facilitated by the provision of the non-destructive test methods to be described later on.

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THE most important cause of eccentricity, however, and at the same time the most difficult one to assess and control, lies in the uneven flow of material around the die face of the extruder. The temperature distribution at the die face is dependent upon the interaction of several factors such as the thermal properties of the insulating material, heat conduction, and speed of extrusion, etc., changes in which result in relative variations in the rate of flow of material at the die. The relatively high pressure of extrusion in conjunction with the uneven flow of material tend to force the conductor away from the cable axis, thereby causing varying degrees of eccentricity.

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AN incidental consequence of conductor deviations from this cause is the severe twist that a cable may experience due to the eccentric flow of material at the die face. A rotational displacement of one turn per yard in an eccentrically extruded cable is quite a common occurrence.

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A FURTHER cause of eccentricity which frequently goes undetected until considerable lengths of faulty cable have been produced, is the misalignment of the guide feeding the conductor through the die. This condition occurs in particular in installations which operate without interruption for a period of several days, generally a complete working week, where as the result of this a progressive misalignment may be produced and remain unnoticed.

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TO overcome these difficulties, it has hitherto been the general practice to stop the extruding process at intervals, in order to take samples of the product by cutting narrow rings of the coating. These samples were examined, and the die re-set with respect to the guide feeding the conductor to correct for any eccentricity observed.

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APART from the undesirable stoppage of production and the destruction of the sample, the difficulties of die control by this method will be obvious from the above remarks; for the problem is essentially a dynamic one: once the extruding process is interrupted for a period of time, the heat distribution in the die cavity will change, rendering the prediction of the degree of eccentricity to be expected for a certain die setting uncertain.

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THE difficulties in the control of eccentricity, which have existed until the development of the present methods of measurement, were responsible for the relative wide conductor deviations that had to be accepted by the users of extruded cables. It may be anticipated, however, that the improved products which it will be possible to manufacture in the future by the aid of the new electronic device will eventually lead to more exacting standards for extruded wires and cables, as well as to a saving in material and labour costs.

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Principle of Measurement

WHEN it became apparent that here was an important field in which electronic measuring technique could be applied with advantage, a careful study was made first of all requirements as to the range and type of cables to be controlled, the permissible tolerances, and methods of indication, etc. Means for determining both the magnitude and direction of displacement of the conductor from the axial position had to be considered, and it was to be an essential feature that the measurements were not to affect the wire or cable in any way. The indication had to be obtainable sufficiently rapidly to allow measurements to be carried out actually during the manufacturing process, without necessitating the stopping of the extruding machine. The method was to be equally applicable to the finished product, for laboratory tests, as well as for the purposes of consumers' acceptance tests; finally, it had to be capable of extension into an automatic system for the control of the extruder in such a way as to ensure an accurately concentric product. Since the nature of the measurements obviously called for relatively complex electronic gear, an additional desirable feature, in the interests of economy, was the possibility of using common equipment for a number of extruders simultaneously.

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THE fact that one and the same extruding machine is frequently employed to coat conductors of widely differing diameters, and using different dielectric materials, led eventually to the development of a method wherein an electric current is passed through the cable under test, and use is made of the magnetic field produced by this current. The method provides for the cable to be guided through a gauge head which carries special circuit elements, and the exact position of the conductor within the dielectric is derived from the effect of the field on

* Patents applied for

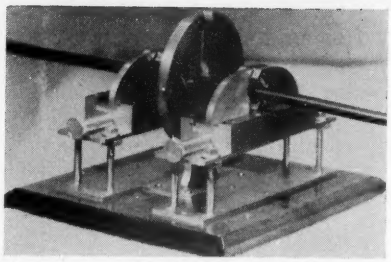

Figure 1

these elements+. Of the several ways of realizing the above principle the most promising proved to be a system wherein alternating current was injected into the cable, and inductive elements were disposed in different angular positions with regard to the axis of the cable, the position of the conductor being determined by comparing the E.M.F.'s induced in the said elements.

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Experimental Electronic Gauge With Mechanical Null Method

AFTER preliminary trials, an experimental eccentricity gauge for use primarily on finished products and relying on the above principle was constructed. Fig. 1 shows the gauge head together with a pair of adjustable cable guides on either side of it. The field-sensitive elements in this case are two bundles of 100 one-inch conductors each held rigidly on a former, in parallel with the axis of the cable and situated diametrically opposite each other on either side of the cable. By inter-connecting the conductors in the manner shown in Fig. 2 so as to form one continuous winding, the individual E.M.F.'s induced in the conductors parallel to the cable are summed.

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WITH the cable core situated centrally between the parallel sides of the winding, equal and opposite E.M.F.'s will be induced in the two branches, and the total E.M.F. appearing at the terminals will be zero. Any lateral deviation of the core will result in an unbalance voltage between the two branches of the winding, the magnitude of which voltage will be a measure of the degree of conductor deviation, or eccentricity.

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THE experimental gauge shown in Fig. 1 employs a mechanical null method, eliminating thereby all errors due to variations in cable current, amplifier gain, mains fluctuations and non-linearity of the indication. To this purpose the position of the former carrying the winding is adjustable in a lateral plane by means of a calibrated micrometer screw. The output of the winding is fed to a transformer having a voltage step-up ratio of 1:100, and thence to a detector amplifier, which serves as a null indicator. In making a measurement it is therefore, merely necessary to adjust the micrometer screw until the meter deflection of the null indicator is reduced to zero, whence the position of the core of the cable, and hence its eccentricity with regard to the cable and cable guides may be read directly off the micrometer drum.

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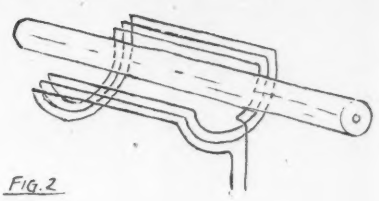
THE coil former and micrometer are supported by a circular bakelite disc which in turn is mounted in a brass frame. As will be seen from Fig. 1, slots in the frame and bakelite disc allow the introduction of the cable from above, without the need for threading the latter. The V-shaped guides are adjustable for the correct overall cable diameter by means of oppositely threaded spindles, controlling the movement



of the two blocks which form each guide. The blocks may be withdrawn sufficiently to allow the cable to be introduced from the top. Rollers bearing on the cable allow the latter to be fed through the gauge head continuously.

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WHEN a measurement in the horizontal plane has been made as described, the bakelite disc supporting the coil former and micrometer may be rotated, and a second reading in the vertical plane taken. These two readings completely and accurately define the eccentricity in angular position and magnitude. Alternatively, should it be desired to express the eccentricity in polar rather than cartesian co-ordinates, the bakelite disc is rotated until the unbalance voltage reaches a maximum. The angular position of the maximum conductor deviation may then be read off directly from the graduated bakelite disc, and the magnitude is determined by the null adjustment of the micrometer screw in this position, as before. Finally, the disc is returned to its original position with the coil former situated horizon-

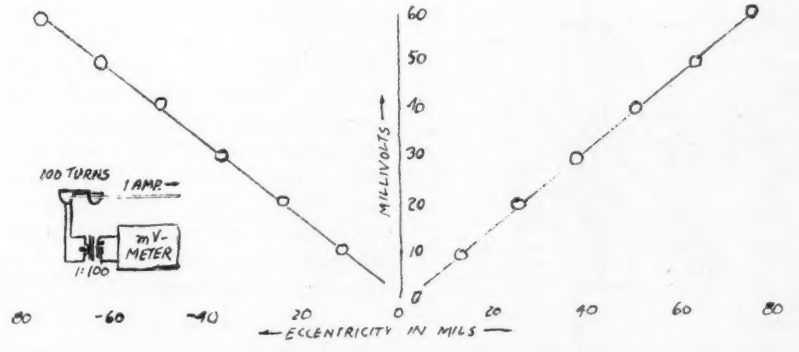


Figure 3

FIG 4

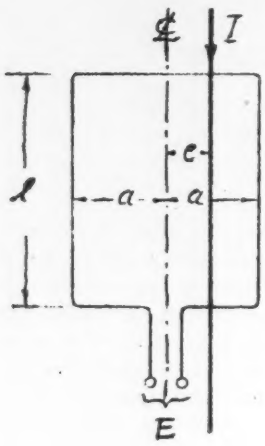
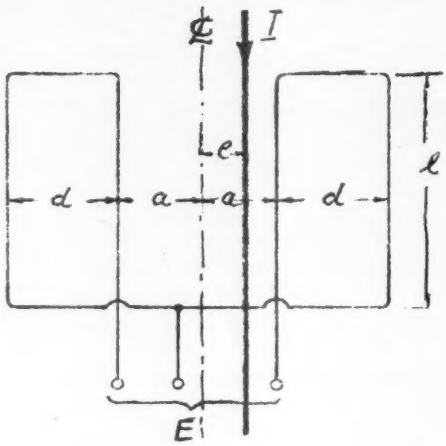


FIG. 6



tally, whence the slots in the bakelite disc and brass frame correspond, and the cable may be withdrawn.

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THE accuracy of readings obtainable with this instrument, for a cable current of 1 Amp., are of the order of ± .001 inches, which proved to be more than adequate for the present purpose. The internal clearance of the coil former is 0.75 inches, and the range of coil adjustment, representing the maximum measurable degree of eccentricity, ± 0.125 inches. This leaves a clearance for a cable of maximum overall diameter of 0.5 inches.

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IT will be apparent that the accuracy of the reading is in no way affected by the type of insulating covering employed, nor by its thickness or the diameter of the conducting core. Thus, eccentricity measurements may be carried out with ease and rapidity for instance, on braided metallic screens relative to an outer covering if the current is injected into the screen instead of the core of the cable, and it has even been found possible to carry out eccentricity measurements on the cores of single conductor lead covered cables, provided no signal currents are allowed to circulate in the lead sheath, the latter causing but little attenuation in the magnetic field surrounding the core.

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FIG. 3 shows a plot of the unbalance voltage obtained at the unloaded secondary winding of the input transformer for different degrees of eccentricity, with the coil former fixed. It is of interest to note that the law of indication is substantially linear over the operating range. The results obtained with the laboratory type of gauge described were sufficiently encouraging to proceed with the extension of the principles employed therein to apparatus suitable for routine production measurements and product control. Before dealing with these more elaborate instruments, it is proposed to consider some of the theoretical aspects underlying the measurement of eccentricity, and their bearing on the design.

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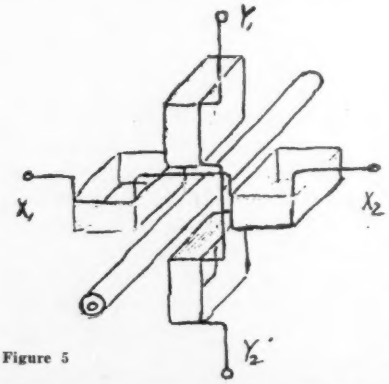

Figure 5

Theoretical Considerations

THE magnetic fieldstrength due to an alternating current I flowing through a long, straight conductor, at a radial distance x is given by $H = 2I/x$, and the flux through an area of length l and width dx is $d\phi = H\ l\ dx = 2lIdx/x$.

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CONSIDERING now a rectangular loop of length l and width 2a, co-planar with the current carrying conductor, but displaced by the eccentricity e (Fig. 4), the total flux through the loop will be given by:

$$\phi = \int_0^{a+e} 2\ell I\,dx/x - \int_0^{a-e} 2\ell I\,dx/x$$

$$= [2\ell I \log_e x]_0^{a+e} - [2\ell I \log_e x]_0^{a-e}$$

$$= 2\ell I \log_e \frac{a+e}{a-e}$$

The E.M.F. generated in this loop, being given by the rate of change of the flux, is therefore:—

$$E = 2\omega\ell I \log_e \frac{a+e}{a-e}$$

For a winding of N turns, the terminal E.M.F. finally becomes:—

$$E_n = 2\omega\ell IN \log_e \frac{a+e}{a-e}$$

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FROM this expression it will be apparent that, in order to obtain a high sensitivity, it would seem desirable to make w IN l large, and 'a' small. There are a number of limitations to these requirements, one of which is the reactance introduced into the cable current circuit by the wound-up, coated section of the cable. It is not practicable as a result of

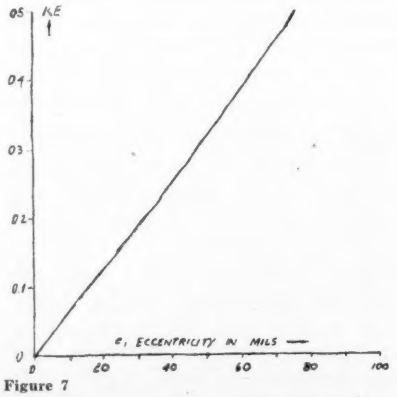

Figure 7

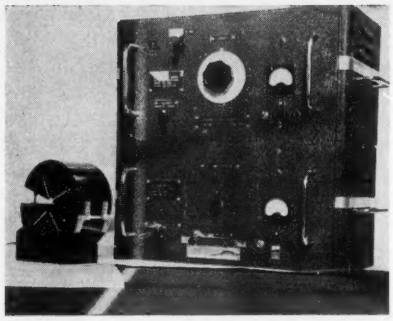

Figure 9

this to raise the frequency w unduly, as this would lead to dangerously high operating voltages for a given cable current I. The magnitude of the latter is limited by similar considerations. The quantities N, l and a are chosen in accordance with the mechanical requirements of the gauge head and the range of overall diameters of cables to be tested. As regards the width of the test winding, 2a, it is apparent that it would be advantageous to make use of different sizes of windings for various cable diameters: windings for use with light cables and insulated wires, where accuracies of the order of ± .001 ins. are required, will possess smaller widths, whereas those for heavier cables, up to diameters of 2 ins., may be considerably wider; accuracies of ± .005 ins. will be adequate in this range.

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BASED on the principles outlined above, and the experience gained with the laboratory type of gauge, two types of commercial eccentricity measuring and control equipments were subsequently developed. These will now be described in more detail.

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Electrical Null Methods

IN the first type of gauge designed for production measurements the null method of indication and its various advantages, which have been enumerated earlier, were retained. However, in order to facilitate and speed up the measuring procedure, the operations of rotation and lateral adjustment of the pick-up winding have been transposed into corresponding electrical adjustments of elements located in an electronic control unit, and an aggregate of fixed windings is employed in the gauge head. Among other advantages this method of operation makes it possible to use a single electronic unit which may, if required be installed in a separate control room, to supervise the production of a number of extruding machines, each of which is fitted with its own gauge head.

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THE use of an electrical method of null adjustment necessitates in the first place the independent derivation of the two E.M.F.'s generated on either side of the cable. The earlier pair of bundles of parallel conductors have therefore been formed into two separate fixed, co-planar windings, as indicated in Fig. 5, a second pair of windings being arranged at right angles to the former. The building up of the windings in an axial direction eliminates errors due to deviations of the cable core in a plane other than that of the winding.

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THE E.M.F. obtainable from one pair of windings, connected in electrical opposition, may be derived with reference to Fig. 4, by introducing individual return paths for each conductor at a distance from the original conductor (Fig. 6). The flux traversing the two loops becomes accordingly:

$$\phi_1 = 2\ell I \log_e \frac{d+a+e}{a+e} \text{ and}$$

$$\phi_2 = 2\ell I \log_e \frac{d+a-e}{a-e} \text{ respectively}$$

From this the terminal E.M.F. for

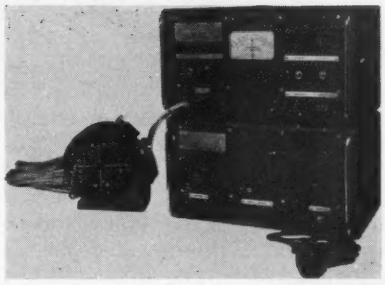

Figure 11

two windings of N turns each becomes—

$$E = 2\omega I N \ell \log_e \frac{(a+e)(a+d-e)}{(a-e)(a+d+e)}$$

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AS an example, the case of a pair of windings, each ¾ ins. wide and 1 inch long will be considered, the separation between the inner conductors of the windings being 2a = ½ inch. Substituting these values in the above expression, and evaluating the logarithmic term, the relationship shown in Fig. 7 is obtained, where the eccentricity e has been plotted in thousandths of an inch. The sensitivity curve is seen to be substantially linear over the operating range as before.

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THE adaptation of this arrangement to a potentiometric null method leads to a circuit configuration wherein the output voltage from one winding is balanced against that of the other, one winding comprising a variable and the other a fixed potential divider in their output circuits. A milliameter, preceded by a three stage detector amplifier, serves as the null indicator. The potentiometer is calibrated directly in thou-

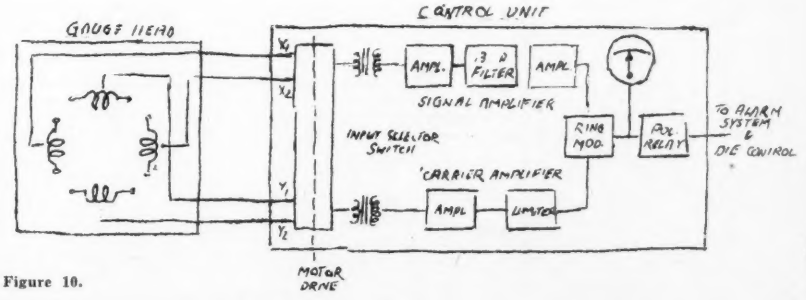

Figure 10.

sandths of an inch eccentricity, the scale being linear and extending from −0.030 to +0.030 inches, with a central zero position. A changeover switch allows one or the other pair of windings to be connected to the potentiometric circuit, measurements in the X and Y planes being taken successively, and each measurement being followed by the corresponding die readjustment if necessary.

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FIG. 8 shows the final circuit arrangement. The four pick-up windings, 12 to 15, are enclosed in a heavy cast iron casing, to prevent measuring errors due to stray fields. The gauge head is shown pictorially on the left hand side of Fig. 9; it consists of two symmetrical halves, accurately hinged, so that the cable can be introduced without threading if required.

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THE main eccentricity control, R. 27, is the central dial of the upper unit of Fig. 9. In addition, two pre-set controls R. 25 and R. 26 have been provided. These potentiometers are in effect eccentricity controls having a range of ± 1/8 inch, and they are permanently connected in the X and Y pick-up coil circuits, respectively. Their provision obviates the need for adjusting the geometrical position of the gauge head, or cable guides accurately to the zero position of the eccentricity dial, when setting up the instrument. Any slight error in the position of the head or guides, as well as any possible inherent unbalance of magnetic assymmetry in the coil assembly may conveniently be corrected by means of these calibrating controls. It has also been found expedient to provide individual pre-set phase adjustments, R. 30 to R. 32, which again are adjusted when setting up the instrument, and serve to take care of small phase unbalances in the input circuits. All pre-set controls are mounted under a lid at the top of the unit, since they require but infrequent adjustment.

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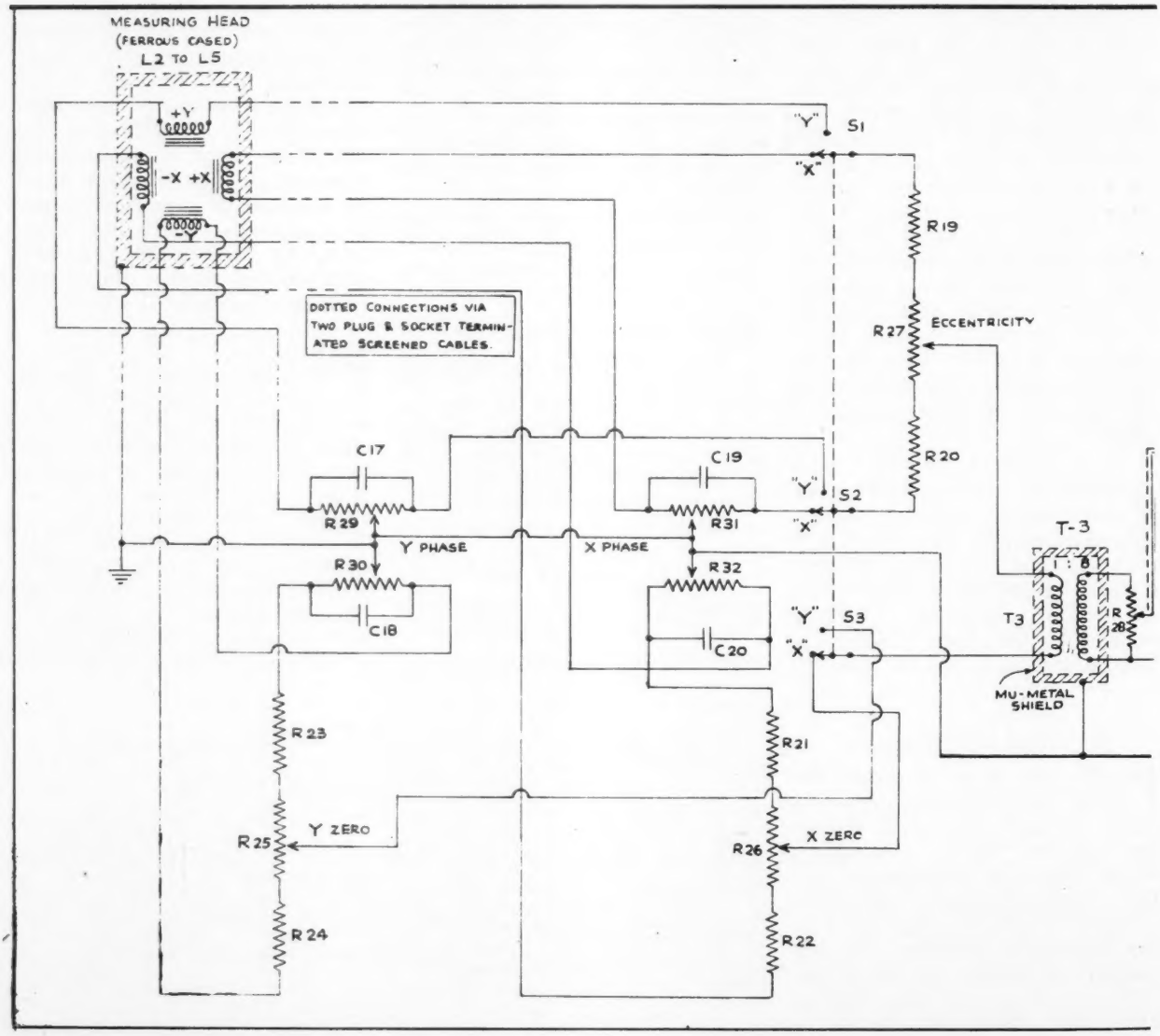

THE X/Y change-over switch is denoted by S1, to S3 in Fig. 8. The potentiometer R. 28 controls the gain of the amplifier and serves as a sensitivity control.

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THE detector amplifier circuit is of normal design, automatic gain control of the first two stages having been provided in order to obtain a logarithmic law of meter deflection.

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THE lower unit in Fig. 9 is the oscillator, the output terminals of which are connected to earth, and to the cable core via a slip-ring on the wind-up drum, respectively. A two-stage resistance-capacitance tuned circuit of conventional design is used, with a power output stage comprising a matching control. The cable current circuit comprises the primary winding of a current transformer feeding a metal rectifier bridge which in turn is connected to a rectifier-shunted milliameter. The latter is calibrated directly in terms of cable current, and its scale extends from 10mA to 1 Amp. A.C., with the 100mA mark, representing the normal cable current, near the center of the scale. An accuracy of about ± .001 ins. eccentricity is obtainable with this value of current and with the full detector amplifier gain. The minimum usuable cable current, defined as that current which will give a noticeable meter deflection of the detector of an eccentricity of .005 ins., is 20mA. A.C.

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Direct Reading and Automatic Control Equipment

FINALLY, the more elaborate equipment affording the facilities of direct eccentricity indication, and automatic die control will be briefly described. While similar, in principle, to the previous design, this equipment incorporates several additional features which are concerned in particular with the provision of maintaining constant

(*Please turn to page* 1169)

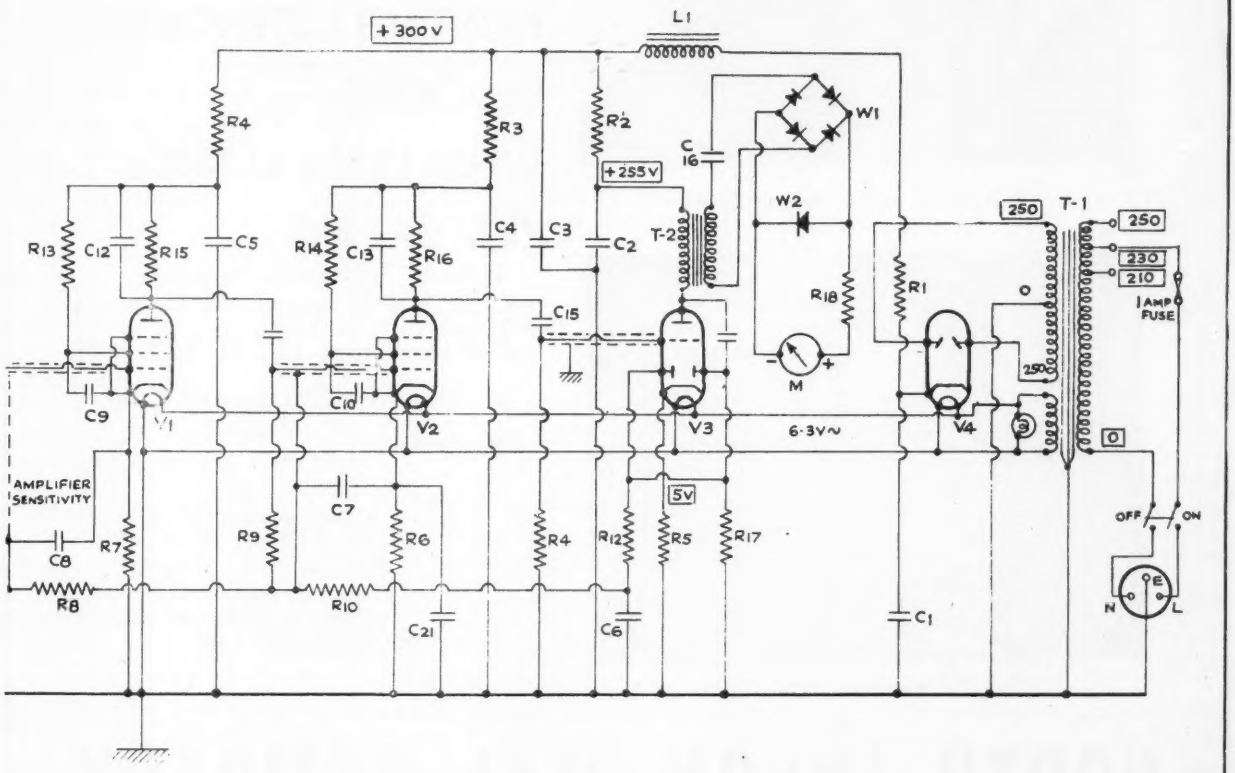

FIG. 8.

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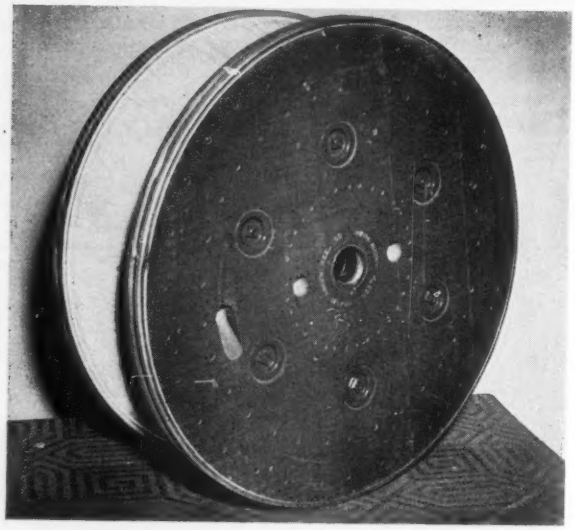

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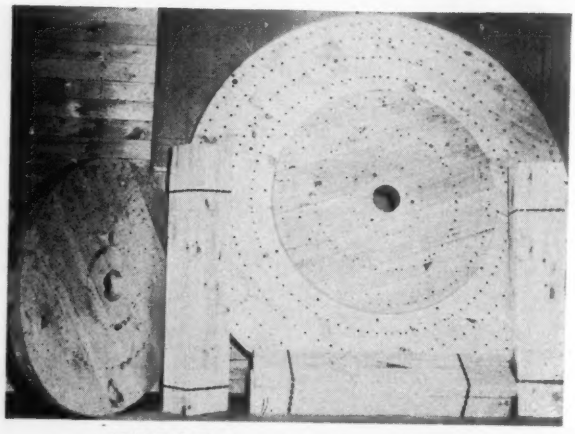

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Potassium Stannate For Tin Plating

By F. A. Lowenheim, Research Dept.
Metal & Thermit Corp., New York, N. Y.

A treatise on the various methods of tin-plating presented before the Wire Association Convention in Chicago in October, 1949. This paper constitutes a valuable contribution to the literature on plating.

THE electroplating of tin on a commercial scale is a relatively new development. Only within the past fifteen years or so have its advantages, as compared with the older standard method of hot dipping, been recognized. Used at first principally because it was the only method permitting satisfactory deposits on irregular shapes having inaccessible surfaces, it has more recently been developed to the point where improvements in plating procedure, methods of application, and electrolytes have led to its adoption for all types of work, including the continuous plating of strip steel and of wire. The history of tin plating has been reviewed by **Kern**[1], **Pine**[2], and **Oplinger** and **Bauch**[3].

* * *

THERE is no lack of satisfactory electrolytes for depositing tin; these may be roughly classified as acid or alkaline. The general characteristics and relative advantages of the two types have been discussed by **Lowenheim**[4]. Acid baths include several proprietary formulations and the stannous fluoborate and stannous sulfate solutions; alkaline, the sodium and potassium stannate baths, as well as the (now practically obsolete) stannous chloride-potash, or stannite, bath.

* * *

ALTHOUGH the acid solutions have their specialized fields of usefulness, the standard tin-plating bath has for some years been the sodium stannate solution[3]. It has been preferred for many reasons: its relatively trouble-free operation, tolerance for impurities, high throwing power, wide range of permissible operating conditions, high quality of deposits obtained, the simplicity of its formulation and the advantages corollary to its alkalinity: it is noncorrosive to plain steel equipment and it represents an additional safeguard in the pre-plating cleaning cycle. Its principal drawback has been the lack of good cathode efficiency at high current densities: in other words, the relatively slow speed of deposition with this solution. With the investigation of the characteristics of potassium stannate[5,6,7,8] and the commercial availability of this compound, these limitations of the alkaline stannate bath have been removed, and it now becomes possible to realize high deposition rates while retaining all the other advantages of the stannate electrolyte.

* * *

THE principal features of the potassium stannate solution are set forth below:

* * *

High Solubility

A SATURATED solution of potassium stannate contains at 180°F. (82°C), 55 oz. of tin per gallon (410 g/1) whereas a saturated solution of sodium stannate at that temperature contains but 20 oz. (150 g/1). While free alkali depresses the solubility of both salts, the potassium solutions retain their advantages throughout the complete range. Thus, potassium stannate permits the use of more concentrated plating baths. At the same time, its solubility becomes greater as temperature increases while that of sodium stannate decreases with rising temperature and since stannate baths operate best when hot, this behavior is important.

* * *

Greater Conductivity

STOICHIOMETRICALLY equivalent solutions show considerably greater conductivity for potassium stannate baths as compared with sodium stannate. Conductivity of solutions containing about 45 g/1 (3.4 oz./gal.) tin and 8 g/1 (1.1 oz./gal.) NaOH or 11 g/1 (1.5 oz./gal.) KOH, for example, at 90°C or 195°F is as follows:

Sodium Stannate	**0.40 mhos/cu. in.**
Potassium Stannate	**0.48 mhos/cu. in.**

* * *

FOR solutions of other concentrations the comparisons would be similar; in general the potassium solutions have about 25% better conductivity than equimolar sodium solutions. For this reason less voltage is required at a given current density.

* * *

More Stability

A STANDARD potassium stannate bath held at about 200°F. (93°C.) for two weeks lost in one typical experiment 1% of its tin content by hydrolysis as insoluble sludge compared with 7% for sodium stannate. This added stability is sufficient to allow the continued use of more concentrated solutions.

* * *

Greater Efficiency

IN stannate tin plating baths the cathode efficiency tends to decrease as the current density is raised. However, the rate of decrease is much slower with potassium solutions than with sodium. At any given current density above about 30 ASF (3.2 amp/dm²) a potassium solution has a higher efficiency than the equimolar sodium solution under the same conditions. For instance, the potassium solution of equimolar concentration to the standard sodium stannate bath is about 12½% better at 40 ASF (4.3 amp/dm²) and 195°F. (91°C.) or 18% better at 40 ASF and 158°F. (70°C.); in baths of higher concentrations and at higher current densities the advantage of the potassium solution is greatly increased; e.g. in a bath of about 3 x the standard composition the potassium solution is 80% better than the sodium at 100 ASF (11 amp/dm²) and 158°F. (70°C.).

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ANODE efficiency depends primarily on the free alkali concentration and the temperature; and the great flexibility of the potassium solution permits the attainment of almost any desired anode efficiency by proper adjustment of the variables.

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Faster Plating

ALL of these factors combine to provide a plating solution which permits the continued use of plating speeds in the neighborhood of six to twelve mils per hour, representing a 100% to 400% increase over those possible with regular sodium stannate baths. Speeds up to even 50 mils per hour have been realized in the laboratory, so that the plating speed of 12 mils per hour just quoted is conservative.

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Operating Characteristics, Solution Formation

EXCEPT for the efficiency vs. current density curves, potassium stannate solutions possess operating characteristics rather similar to those of the sodium stannate bath: consequently a plater familiar with the sodium solution will have little difficulty in operating the new solution. General operating instructions for the sodium stannate bath are easily available[8,9,10], and require only to be modified by the substitution of appropriate changes in concentration of constituents and current densities.

★ ★ ★

IT should be emphasized that for successful operation of an alkaline stannate bath—either sodium or potassium—the most important single factor is the proper control of the tin anodes. During operation these must at all times be covered with the typical yellow-green film which ensures that the tin is dissolving as stannate. When this film is lost, or fails to form, tin dissolves as stannite, the presence of which is the principal cause of poor deposits. On the other hand, if the film becomes brown or black, it is a sign that the anode has become passive and is not dissolving at all: under such conditions satisfactory plating will continue for some time, but eventually the solution becomes depleted of its metal content and has to be replenished by addition of fresh stannate. Of the two improper conditions, lack of any film is the more serious in its immediate results.

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THIS anode film is produced by impressing on the anodes initially a higher current density than the normal or operating density. Formation of the film is evidenced by a sudden increase in the operating voltage: when this takes place the current density is reduced to its operating value and plating proceeds. Provided anode contacts are good and no interruption in the tank load takes place, and the proper combination of temperature, current and composition of solution has been chosen, the yellow-green film will last indefinitely or until the anodes have been consumed. The film must be re-formed after shutdowns of any duration. The following hints will indicate the steps to be taken in case of trouble from this source.

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IF the anodes appear gray or white, no film being evident, and spongy or non-adherent deposits are obtained: the initial current density may not have been high enough to form the film; remove a few anodes and put them back one at a time while the current is on. If a film is lost after having formed: check anode contacts. If O.K., operating conditions must be checked: the free alkali may be too high, current density too low, or temperature too high. While these conditions are being rectified temporary removal of some anodes (decreasing anode area and increasing anode current density) will enable operation to proceed.

★ ★ ★

IF the anodes are covered with a brown or black film and are gassing excessively: the anode current density is too high (add more anodes); the temperature is too low, or the free alkali is too low. If conditions are rectified quickly, the brown or black film may disappear, but if it has persisted for any appreciable time it may be necessary to remove the film either mechanically or by immersion in hydrochloric acid.

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POTASSIUM stannate plating solutions are very simple in composition, having only two necessary ingredients: potassium stannate and free potassium hydroxide. (The addition of potassium acetate, analogous to the sodium acetate sometimes recommended in sodium stannate baths, is not essential). Due to pick-up of carbon dioxide from the atmosphere, a third constituent potassium carbonate, forms in these solutions and may build up to fairly high concentrations in a bath which has been in operation for a long time; but this is an inert and harmless impurity.

★ ★ ★

PROPER operation of a potassium stannate plating bath, then, entails only the control by

analysis of the tin and free alkali concentrations; the maintenance of temperature and current densities at the levels determined upon; and the anode control already considered.

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POTASSIUM stannate solutions are extremely flexible, and no recommendation is given for any "all-purpose" bath; some specific cases are considered here. In general, a knowledge of the characteristics of the bath will enable a set of conditions to be chosen which will best fit each individual case. For a detailed treatment of these relationships the reader should consult references, 5, 6, 7, 8.

★ ★ ★

THE effect of change in operating variables upon the characteristics of the bath is set forth in summary form in table I.

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Some Typical Formulations

AS stated previously, the range of compositions available in the potassium stannate-potassium hydroxide system is very wide, permitting an optimum composition to be chosen after consideration of the requirements of each individual case. Thus the plater should weigh these factors:

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WHAT plating speed is desired? This determines cathode current density.

★ ★ ★

WHAT anode / cathode area ratio can be obtained? (In general, the higher this ratio the better.)

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WHAT is the highest economical temperature? Again, the higher the better.

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CAN close control be maintained? Where conditions can be closely controlled, a high-speed concentrated bath may be indicated; but where such control is not available less concentrated solutions are usually more economical even at some sacrifice in speed.

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THE range of practical bath compositions is indicated, but by no means exhausted, by these examples:

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TABLE I

EFFECT ON of INCREASING:	CATHODE EFFICIENCY	ANODE EFFICIENCY	PLATING RANGE	CONDUCTIVITY
Temperature	Increases	Increases	Increases	Increases
Free Alkali	Decreases	Increases	.....	Increases
Tin (Stannate)	Increases	Little Effect	Increases	Decreases
Current Density	Decreases	Decreases	.....	.....
Substitute Na for K	Decreases	Little Effect	Decreases	Decreases

The last line of the table indicates many of the points of superiority which potassium stannate possesses over sodium.

Bath No. 1

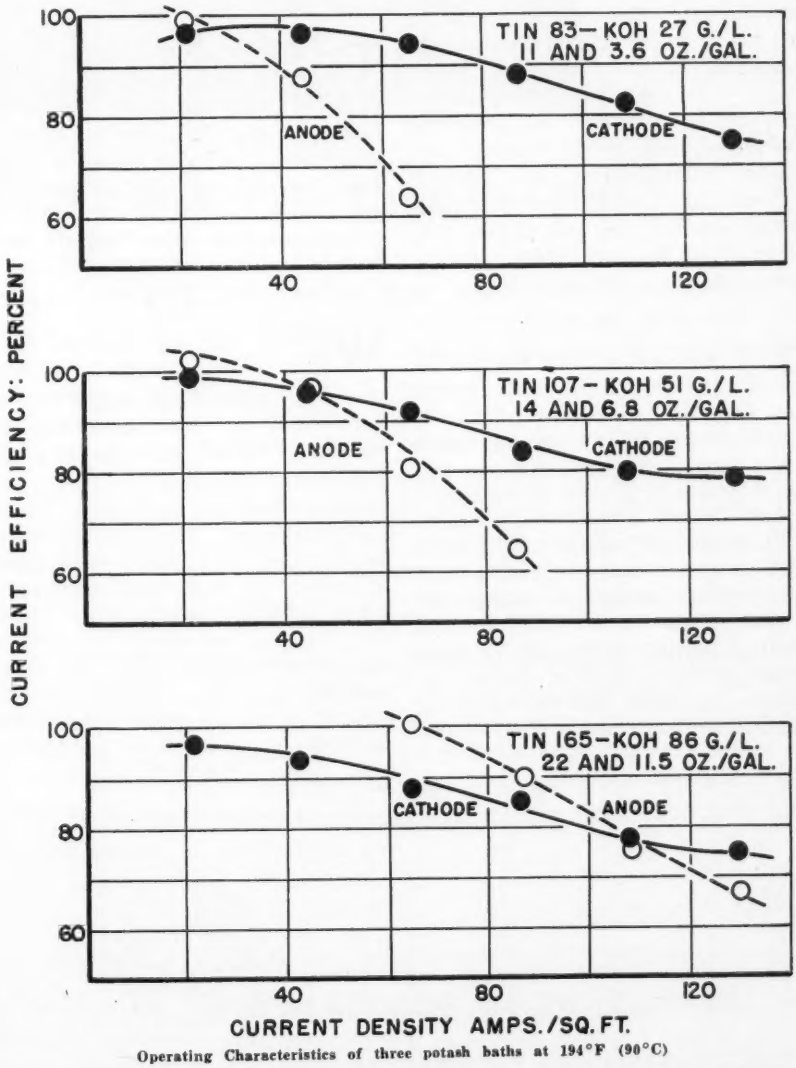
Potassium Stannate 16 oz./gal. (120 g/1).

(Tin 6 oz./gal.) (45 g/1)

Potassium Hydroxide (free) 2-2.5 oz./gal. (15-19 g/1).

Cathode Current Density 30-100 ASF.

Temperature 160 - 200°F (70 - 94°C).



Operating Characteristics of three potash baths at 194°F (90°C)

Bath No. 2

Potassium Stannate 25 oz./gal. (188 g/1).

(Tin 9.5 oz./gal.) (71 g/1)

Free Potassium Hydroxide 4.6 oz./gal. (35 g/1).

Temperature 175 - 200°F (80 - 94°C).

Cathode Current Density up to 150 ASF.

Bath No. 3

Potassium Stannate 50 oz./gal. (375 g/1).

(Tin 19 oz./gal.) (142 g/1)

Free Potassium Hydroxide 2-3 oz./gal. (15-23 g/1).

Temperature 160-200°F (70-94°C).

Cathode Current Density up to 250 ASF.

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Anode area must be considerably greater than cathode area if all tin is to be replaced by anodic solution.

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OTHER solution compositions are given in the figure. All these compositions are merely typical of the infinite combinations possible: the one chosen will depend on the individual requirements in each specific case.

★ ★ ★

THE solution at the top of the figure—tin 83, KOH 27 grams per liter (11 and 3.6 oz./gal.) — would be suitable where the anode to cathode ratio may be as high as 2 or 2.5 to 1; the cathode efficiency remains above 85% up to 100 amps. per square foot, while the anode current density should be held to about 40 amps. per square foot. With this solution normal plating speeds can be more than doubled without undue increase in bath concentration, if sufficient anode area is available.

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THE second solution in the figure (tin 107 g/1, KOH 51 g/1 - 14 and 7 oz./gal.) would be appropriate where the anode to cathode ratio is about 1.5 to 1. Cathode efficiency at 90 amps. per square foot is balanced by the anode at 60 amps. per square foot, and both are above 85%.

★ ★ ★

WHERE anode to cathode ratio must be held to 1 to 1, and high plating speeds are still desirable, the third solution in the figure (tin 165, KOH 86 g/1 or 22 and 11 oz./gal.) would be suitable. Anode and cathode efficiencies are both about 80% at 100 amps. per square foot.

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The Alloy Anode

THE advantage of providing as high as possible anode area, in relation to cathode area, is evident from the examples: for the higher this ratio, the more dilute a solution can be used for any given plating speed. Dilute solutions, of course, connote less dragout loss and less initial cost per gallon.

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WHERE for any reason this high anode/cathode ratio cannot be maintained, a recent improvement in the operation of stannate baths may be helpful. This is the use, in place of pure tin anodes, of anodes containing about 1% aluminum[11]. Such anodes have been found to dissolve with good efficiency at about double the current densities usable with pure tin anodes, without introducing any complications into the bath operation: the aluminum, of course, does not plate out at the cathode.

★ ★ ★

Summary

A RECENT improvement in the alkaline stannate bath is the introduction of potassium stannate. This chemical, now commercially available as a good technical grade, when used in place of sodium stannate, permits the attainment of much higher plating speeds while retaining all the advantages of the alkaline stannate solution. The general characteristics of the potassium stannate solution are considered and suggestions for its use are given.

★ ★ ★

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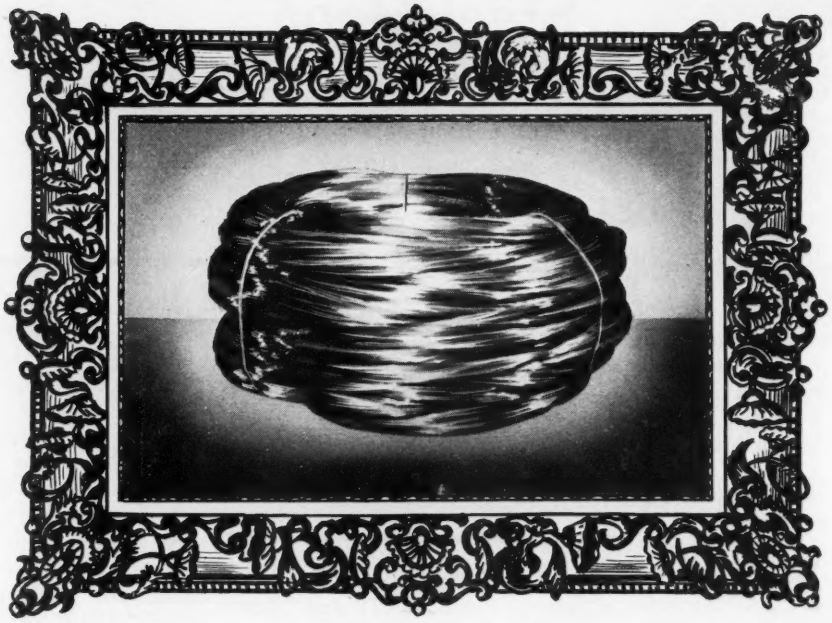

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The Use of Phosphorus in Plain Carbon Steel Hoop

By R. W. Sandelin, Chief Metallurgist
Stockham Valves & Fittings
Birmingham, Alabama

This paper by Mr. Sandelin, whose paper on galvanizing won the Wire Association Medal Award in 1940, brings out some interesting facts concerning phosphorus that should merit consideration in connection with wire that requires severe cold working.

THE use of phosphorus as a beneficial alloying element in steel has received a considerable amount of attention in recent years, particularly with the advent of the comparatively new low alloy steels. In looking over the literature concerning such practices, we find that phosphorus contents as high as 0.150 percent and higher are being used successfully with particular advantages over the low phosphorus steels. In low carbon steels the effect of phosphorus when correctly used, is to notably increase the yield strength, tensile strength and hardness with but little loss in ductility.

★ ★ ★

INSOFAR as plain carbon steels are concerned, it is generally conceded that the maximum useful phosphorus content is somewhat lower than for the low alloy steels. Nevertheless the phosphorus contents which can be successfully utilized are far in excess of the "0.045 Max." generally specified. In considering the effects of phosphorus, one must take into account and distinguish between phosphorus which is residual or that which is added in the ladle as ferro-phosphorus. In the latter instance, the resulting effects of phosphorus seem to be far more beneficial. This is probably due to the influence of factors other than phosphorus which have a direct bearing steel quality.

★ ★ ★

IN a series of articles comprising a correlated abstract of researches in the field, Gillett (1) has presented and discussed the results of the various investigations from the early pioneering efforts of d'Amica (2) and Unger (3) up to more recent times. Unger showed that for a variety of articles made from high phosphorus steel such as rivets, nails and several sheet products, that none of the steel exhibited brittleness under cold working. The steels for the investigation were prepared by rephosphorizing a single heat of steel using different amounts of powdered ferro-phosphorus added to the molds during teeming. Lorig and Krause (4) conducted a comprehensive study of the effect of phosphorus on the properties of low carbon low alloy steels. They found among other things, that the impact strength of plain low carbon steels containing as high as 0.250 percent phosphorus was notably improved by the grain refining influence of aluminum. Cross and Krause (5) in studying the effects of phosphorus as an alloying element in steels for high temperature use found that increases in tensile and yield strengths occurred at the temperature studied, also that phosphorus increases resistance to deformation under sustained load at high temperatures.

★ ★ ★

1. The figures appearing in parentheses refer to the bibliography appended to this paper.

IN this paper it is intended to show that phosphorus can and in fact has for many years been used as an alloying element in the manufacture of ordinary medium carbon steel strip. The product referred to is more generally known as hoop steel, and is used where extra hardness and stiffness are required for making a tight barrel. Such barrels are generally used for storing and aging of costly distillery products or other materials of a like nature, Figure 1 illustrating one form of such a barrel.

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THE chemical composition for the hoop depends largely upon the consumers' requirements or specifications. Generally speaking, however, the analysis will conform to the following:

Carbon—The carbon content will vary depending upon the desired strength and will range from 0.25 to 0.40 percent.

Phosphorus—The strength of the strip, particularly the yield strength, is affected to a marked degree by variation in phosphorus content. The amount of this element usually ranges from 0.50 to .075 percent, greater or lesser amounts being less effective.

Sulphur—Under 0.035 percent.

Manganese—This element also notably affects the strength of the strip, the usual composition ranging from 0.45 to 0.60 percent.

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PHOSPHORUS aids in obtaining a uniformly smooth blue finish which is desirable to the consumer. Increased resistance to corrosion is also obtained, but this is not a factor of prime importance since

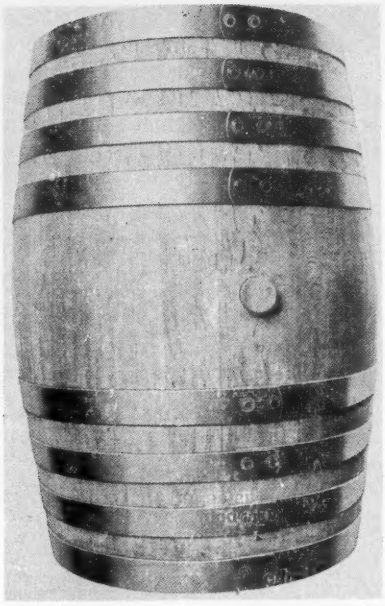

Fig. 1. — Finished Barrel ready for use. * *
(Courtesy "The Wooden Barrel")

hoops required for continual outdoor service are hot dip galvanized.

★ ★ ★

IN the manufacture of barrels the hoops are forced on the sides of the barrels as shown in Figure 2. One of the most important physical properties to be considered is the yield strength. This is true because hoops are forced or "stretched" to a certain position on the barrel and a high yield strength produces a tight fit. "Soft" or low yield strength hoops do not grip the sides of the barrel tightly but continue to stretch so that they are easily forced over the bilge of the barrel.

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THE effect of phosphorus on the ordinary physical properties of thin hot rolled strip can be observed from data in Table 1.

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IT can be readily observed that the yield strength increases with increase in the phosphorus content without loss in ductility until a high limiting value is reached at which point the elongation values drop and the strip becomes very sensitive to small notches or surface injuries. This can be observed in the tensile tests at which time the extremely high phosphorus strips break repeatedly in the jaws of the machine, the breaks originating at places where the jaws "bite" into the surface. This is not observed when the phosphorus content is kept below 0.075 percent.

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CARBON affects the strength of the strip in the usual manner; Table II showing the strengths of hoops for the extremes of the carbon range for this class of material.

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THE thickness of the strip being rolled also notably affects the physical strengths, the effect being to increase the yield and tensile strengths in the lighter gages as shown in Table III.

★ ★ ★

Fig. 2.—Hoops being forced on side of barrel.
(Courtesy "Shaxon Steel Corp.")

IN the illustration, Table III, the decrease in strength, particularly the yield strength is due partly to the slower cooling of the heavier section.

★ ★ ★

THE effect of cooling rate is easily demonstrated by allowing

TABLE I

Description	Size	YP	TS	% Elong. 8"	C	P	S	Mn
Low Phosphorus	1¾ x 18 ga.	57500	78200	18.3	.30	.019	.028	.54
High "	"	61400	81200	20.2	.30	.056	.026	.51
High "	"	62300	82300	20.2	.30	.078	.029	.58
High "	"	64400	86400	16.6	.30	.087	.030	.52

TABLE II

Description	Size	YP	TS	% Elong. 8"	C	P	S	Mn
Low Carbon	1¾ x 18	60000	795000	18.5	.25	.064	.024	.55
High "	"	68200	921000	14.5	.40	.069	.020	.54

TABLE III

Description	Size	YP	TS	% Elong. 8"	C	P	S	Mn
Light	1¾ x 18	62800	81700	18.6	.31	.060	.024	.52
Heavy	2 x 16	59600	80600	19.3	same as above			

TABLE IV

Description	Size	YP	TS	% Elong. 8"	C	P	S	Mn
Coiled hot	1¾ x 18	46990	68000	24.7	.24	.058	.026	.50
Coiled cold	"	56300	74500	21.6	same as above			

one strip to cool individually on the booling bed and compare it with a strip which is coiled immediately after delivery from the finishing rolls so that its heat is dissipated slowly. Data shown in Table IV show the results of such an experiment.

★ ★ ★

THE strip which had been coiled hot—the strip showing "color" after coiling—retained a spring-like quality that caused it to curl whereas the "cold" strip laid flat when uncoiled.

★ ★ ★

THE decrease in yield point and tensile strength due to coiling while hot was approximately 9300 and 6500 pounds per square inch respectively, while the elongation, in 8 inches, increased 3.1 percent.

TABLE IV experiment shows to what extent the physical strengths of thin sections may vary and illustrates the importance of consistency in heating so that all portions of a long hot rolled strip have the same properties.

★ ★ ★

FINISHING temperature also plays an important role in determining the physical properties of hot rolled strip Briefly stated, the higher the finishing temperature, the lower will be yield and tensile strengths.

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FROM the foregoing, it can be seen that many factors affect the strength of hot rolled strip, chemical composition being but one of several. Assuming, however, that mill operation is consistently uniform, the chemical composition, mainly the carbon and phosphorus contents, determine what the properties of the finished product will be. Phosphorus, therefore, is the chief, and in fact the most important alloying element in a plain carbon steel for the manufacture of a certain variety of steel hoops.

★ ★ ★

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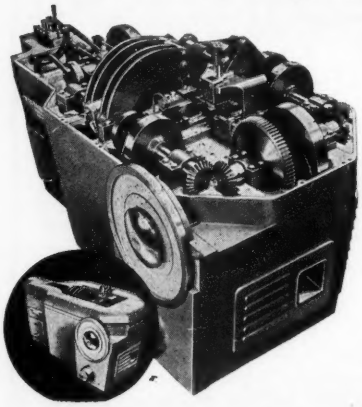

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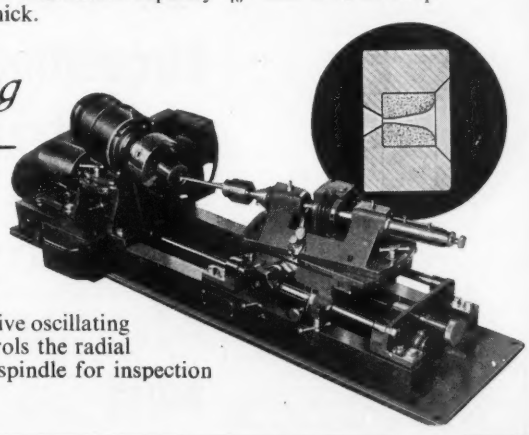

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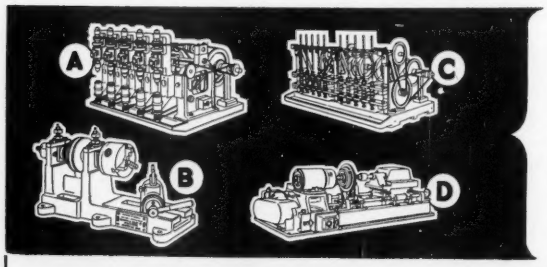

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The Waste Pickle Liquor Problem

By Wallace G. Imhoff, B.A., B.S., M.S., Met.E.,
President, Wallace G. Imhoff Company,
Los Angeles, California

Part II

For text matter see Part I published in the November, 1949 issue of WIRE AND WIRE PRODUCTS. This bibliography will be invaluable to those wishing to make a detailed study of this problem.

"The Waste Pickle Liquor Problem"

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(*Please turn to page 1154*)

The Story of the Twentieth Annual Convention of the Wire Association

The Story of the Wire Association Convention held in Chicago, Illinois, October 17th-21st, 1949.

FROM every angle our Twentieth Convention may be described as a howling success. By two o'clock of the first day two hundred and forty had registered and the final figures totaled approximately four hundred.

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IT was much regretted that our Executive Secretary, **Dick Brown,** was unable to be present and many messages of sympathy were left with other members of his official family to be extended to him. The Directors of the Association, however, summarized the very general sentiments of the members in a telegram sent to him on Monday, the seventeenth, in which regret of his inability to be present was expressed.

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THE Convention was opened at eleven o'clock Monday morning with an address of welcome by our President, **Jack Seymour,** who at that time announced a substitute program for Tuesday, which was to have been devoted to an all-day plant inspection visit to the Joliet Works of the American Steel and Wire Company, cancelled because of the steel strike.

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MR. SEYMOUR then introduced **Earl Glen,** Chairman of the Ferrous Division of the Program Committee. Mr. Glen outlined the work of his committee and gave those attending a pre-view of the papers to come. The meeting got under way with **A. F. Anjesky** presiding as Chairman. The two papers, "Handling Wire and Wire Products in the Wire Mill" and "Possibilities in Handling Wire and Wire Products" were ably presented by **F. L. Hayden,** Works Manager at Hamilton for the Steel Company of Canada, and **J. W. Galloway,** Chief Engineer of B. Greening Wire Company, Ltd., respectively. They covered various methods and the equipment needed for the efficient handling of materials. The first paper is perhaps better described as a discussion of how to plan for better material handling. The second stressed methods of handling, starting with 300 pound rod bundles. In the papers overhead cranes, trolley systems, trucks and other methods were covered and discussion even brought in such questions as floor materials. It was pointed out that package sizes of rods and wire are constantly going up, necessitating many changes in equipment, but which is paying off in reduced handling costs. Interest was evinced in the new vertical stacking method of storage developed recently by the Chairman's company, the Cleveland Crane and Engineering Co. As one member stated, the question of efficient material handling is near and dear to the heart of every wire man. One point that was stressed is that any system devised for one mill may not fit another and that each mill will have to adopt such procedures and equipment as will be best adapted to its size, products and other circumstances.

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IN the afternoon on Monday, the session convened with **Curtis Voightlander** in the chair. He introduced **R. S. Brown,** Chief Metallurgist of Rylands Brothers, Ltd., of England, who presented a scholarly, yet practical paper on "Plastic Strain and Hysteresis in Drawn Steel Wire." This paper discussed wire rope and rope wire studies relating to fatigue and life and covered various testing methods now in use. Mr. Brown commented on the limitations of present equipment and said that he looked for better forms of testing in the next few years that would reveal more of the secrets of wire and provide much-needed information on fatigue questions not yet fully answered. Especially needed are laboratory testing methods that are readily suited for day-to-day mill practice in correlating the plastic and tensile properties of cold drawn wire.

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FOLLOWING this came a paper on a really hot subject, entitled "Back Pull Wire Drawing." The paper had been jointly prepared by **H. J. Godfrey** and **Dartrey Lewis,** development Engineer and Chief Development Engineer, respectively, for the John A. Roebling's Sons Company. Mr. Lewis delivered the paper. It has been a long time since back-pull has been discussed in print in this country, but the much-mooted process is ever a live issue. Two years ago the Marshall-Richards Company in England developed a machine that incorporated some excellent features. The paper was devoted to extensive experiments on high carbon wire conducted at the Roebling plant on these machines. It was explained that die pressures are essential to good plastic deformation and that wire will stand squeezing in drawing better than pulling. Pulling can be exerted to such an extent that the only function of the die is to

size the wire, but this extreme has not proven practicable, because wire thus stretched is subject to undue breakage. In practice at Roebling it has been found impracticable to impart a back-pull of more than 33 1/3%, as pulls of 50% or more induce breakage. These low back-pulls provide power savings of only 7 to 12%, it developed, which caused **Ken Lewis,** bless his contentious heart, to assert that a back-pull of only 33 1/3% was not sufficient to hit the pay-dirt and "get into the money." The real economies come from back-pull realms above the one-third mark, and should be possible of realization since 50% of the pull through a die is friction and the balance the resistance of the metal to plastic deformation.

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THE principle nevertheless does decrease the tendency of wire to split, lowers die temperatures and increases die life. The promise of great things from reactive wire drawing has not yet been substantiated, but it was brought out that advances in both machine design and in knowledge of how to draw wire in them, may ultimately disclose distinct advantages. The advantages at this point, however, are distinctly on the plus side.

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TUESDAY morning an "off the record" program was presented, arranged by the Directors of the Wire Association on Monday as a substitute for the plant inspection trip to Joliet. The meeting, a Labor Relations Seminar, proved to be a highly interesting and instructive one. **F. A. (Dutch) Westphal** served as Chairman, dividing the program into three parts: 1) A discussion of the present labor situation: 2) the labor contract: 3) an exploratory discussion of labor problems.

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FOR the first section the Association was addressed by **Merrill Shepherd** of Pope and Ballard, who are legal counsel for a group of steel companies. Mr. Shepherd gave a masterly review of the factors leading up to the present strike, a comparison of the steel industry's position with respect to that of the automotive industry, Ford in particular, since they have signed a non-contributory contract. Details cannot be given here, but it is safe to state that those who were privileged to participate in the Seminar went away with a clearer notion of the issues involved. The Wire Association is much indebted to Mr. Shepherd for his excellent handling of an exceedingly broad and complex subject.

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DUTCH WESTPHAL, who is himself an authority on labor relations, then proceeded to an analysis of the contract, with comments on its different provisions and the points to bear in mind in working out such an agreement.

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THE final phase of the Seminar covered labor or human relations. He described the methods by which labor unions were run, the attitude of the average union card holder and gave some practical hints on dealings with unions and the handling of grievances. It was brought out that the union is operated like a dictatorship and that local union representatives have a tough time. They are human beings, with jobs and homes to consider, and while often disposed to be reasonable, like most union members, they have little to say and can only carry out orders—or else!

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IN the afternoon a visit to the Armour Research Institute was arranged, many members taking advantage of the opportunity to go there to see the work they are doing on recording, field and other types of wire. Those who made the trip felt well-rewarded, as they had an opportunity to get behind the scenes on a type of work that is vastly more concerned with things to come than is possible in an average well-equipped wire mill laboratory.

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WEDNESDAY morning under the chairmanship of **E. J. Crum,** members were treated to a Carbide Die Symposium that many say was the best organized such session in our history—some have said the best they have seen anywhere. The "Board of Experts," or panel, was comprised of **Walter Schofield,** Carboloy; **E. T. Miller,** Firth-Sterling; **E. A. Henry,** Vascoloy-Ramet; **George Fecsen,** Pittsburgh Steel; **E. R. Duthaler,** J&L.; and **Art Hedman,** Wickwire-Spencer.

★ ★ ★

MODERATOR Crum presented a picture of a hypothetical wire mill for which illustrations of typical equipment were shown and the personnel requirements described. A second section was devoted to the methods of servicing dies; another to the processing of manufacturing dies; one to the functions of the bell, approach, relief angles and the bearings of dies; and a last to a discussion of die failures.

★ ★ ★

AS the presentation progressed different parts of each of these questions were turned over to panel members for comment and discussion. A lively question and answer period followed in which angles, bearing lengths, degree of polish and other factors were commented on. Growing out of this, general agreement seemed to be that about 16° for copper and 12° for steel were the best approach or entering angles, with bearings or drawing necks kept as short as possible. It was suggested that bearings for copper, high-carbon and low-carbon steel would give the best results if kept at 1/2, 2/3 and 1/2, respectively, of the hole diameter. As speeds go up even shorter bearings are indicated as essential.

★ ★ ★

THE afternoon was taken up with the colorful Annual Luncheon, graced and enhanced by the presence of the wives of the members who had come for the occasion. Through the thoughtfulness of the Assistant Secretary, **Mrs. Spengel,** corsages for the ladies were presented to each as she arrived for the luncheon.

★ ★ ★

DIRECTLY following the luncheon, President Seymour presented **R. S. Brown** with the annual medal award for the outstanding paper contributed by a member in the year 1948. This was an appropriately inscribed bronze plaque in recognition of his paper, "Wear Resistance of Wire for Rope Wire." **Christian Witteveld,** for his paper, "Brass Wire Processing," and **C. A. Zapffe** and **M. E. Haslam** for their joint paper, "Evaluation of Pickling Inhibitors from the Standpoint of Hydrogen Embrittlement" were awarded Certificates of Honorable Mention. These awards represent the opinions of members of the Board of Directors as to the most outstanding contributors for the year 1948.

★ ★ ★

LT. COL. ALLAN B. DOVE, Superintendent of the Dominion Works of the Steel Company of Canada, delivered the annual Mordica Memorial Lecture following the luncheon. The subject was "The Corrosion of Steel and Its Protective Metal Coatings." Far from being a dry technical dissertation on an involved and complicated subject, Mr. Dove in frequent extemporaneous asides, humorous sallies and explanatory illustrations, brightened his text matter so that it was entertaining as well as enlightening. The ladies enjoyed it, so it must have been good! The lecture will appear in the January issue of WIRE AND WIRE PRODUCTS.

★ ★ ★

THE balance of the afternoon was given over to the annual Business Meeting of the Wire Association, at which financial reports and other business were covered and in which the main subjects under consideration by the Directors were reported. One of these, because the next Annual Convention will be in Baltimore, was the question of holding a regional meeting in the Mid-West in the Spring. Also from the floor the matter of holding the Convention at a slightly later date was raised. The matter is to be taken under advisement by the Directors at their next meeting.

★ ★ ★

OUR story would not be complete without reference to the Stag Smoker. This popular annual event drew uniformly enthusiastic praise from all quarters. Much credit is due **Eber Hubbard, Jr.,** who arranged for the show and whose good taste and excellent judgment resulted in a show that was rated all the way from one of the three best to the best.

★ ★ ★

AN unscheduled and fine tribute was paid to **Gus Zapp** by **Ken Beardslee** who called Gus to the mike and recalled his long years of running the Smoker-Show and his straight-shooting qualities as a man and a competitor.

★ ★ ★

BEFORE the show got under way a drawing of room numbers won for **Ernie Clark** a prize — a rubber bath mat so decorated that it has to be seen to be appreciated. The lucky stiff!

★ ★ ★

THURSDAY morning the session, presided over by **Ray S. Simmons,** chairman, was comprised of three papers. The chairman introduced as the first speaker, **D. L. Doty,** Supervisor of the Inspection Division, Jones & Laughlin Steel Corporation. In his paper, "Continuous Cleaning," Mr. Doty pointed out that while batch cleaning is in general use and while continuous cleaning is not new the latter is being used with great success in some mills. The batch method gives rise to over-pickling of the outside coils, underpickling of the inner strands and to a tendency of the work to develop rust spots on standing.

★ ★ ★

THE linear space required for continuous processes is a deterrent to many mills, but the process produces more uniform work that permits of subsequent higher drawing speeds. Important in the continuous method is the use of coatings that will not rub off on sheaves. This gave rise to an active discussion on coatings, the various types of which and their qualities—lime, borax, phosphates and proprietaries—were taken up.

★ ★ ★

MR. DOTY also described the several types of mechanical cleaners and de-scalers, but it appears that they are mostly in experimental stages of development and no one as yet has been able to say, 'This is it, gentlemen.'

★ ★ ★

STANLEY P. WATKINS, Assistant General Manager of Armco Steel's Rustless Division gave an enlightening and valuable paper: "Processing Stainless Steel Wire." He brought out the fact that stainless steel, once a problem child, is now no longer difficult to handle. There are some fifty grades of stainless steel in commercial production. The processing problems and equipment were described and illustrated and a discussion of the descaling techniques presented. Due to the high rolling temperatures, stainless develops a healthy scale that, however, is more tightly adherent than the oxides formed on steel. Various acid methods have been used, but the DuPont sodium hydride and the Hooker caustic soda processes have been adopted by most mills because of the greater speed and better surfaces resulting. Many examples of stainless wire applications were shown, one of the things contributing to their growing use being the availability of electro-polishing.

★ ★ ★

SOME discussion followed on matters like the use of Turks Heads to give good physicals, the use of stainless for wire rope strand, how to get increased elastic limits on springs by heat-treating and the types of metallic coatings suitable for stainless. It was also brought out that the uses of stainless will expand as the price drops, one of the factors in its high cost being the necessity (some will question this) for lead coating before drawing. It was also stated that either zinc or lead

(*Please turn to page* 1163)

Join The Wire Association

To Wire Mill Men

Have you considered joining the Wire Association?

You are cordially invited to become a member.

Dues are $15.00 per year.

This includes a subscription to WIRE & WIRE PRODUCTS, a copy of the ANNUAL BUYERS GUIDE and the other services and privileges that go with membership in the Wire Association.

The Wire Association

Richard E. Brown,
Executive Secy.

300 Main Street, Stamford, Conn.

The very timely statement of the International Nickel Company in an advertisement run by them in the newspapers in Huntington, West Virginia, where they produce mill products, is reproduced here because of its excellence. It is based on material found in Governor Bradford's journal, now in the Massachusetts State Archives. Freedom *and* plenty *went hand-in-hand then as they must today.—Editor's Note.*

There was PLENTY for ALL

...only when men were Free to work for Themselves!

DID YOU KNOW that the Pilgrims nearly starved to death? That they suffered hunger for two long years, with *never* enough food in the Colony's storehouse?

Have you heard how the Governor and his councilors had complete control of the land and what people produced? How they tried to *rouse* the Colonists to raise more grain; and how they found a way that worked?

During their first year, food was scarce. Even after the 1621 harvest was gathered, the daily ration was only about a quarter of a pound of bread for each person.

In the spring of 1622, the Colonists complained they were too weak to work raising food. Although they were, on the whole, deeply religious, some were so hungry that they stole food from their starving fellow-workers.

Young men complained because they had to work hard to feed other men and their wives and children. Strong men who were heads of families griped. They said that even though they put in long hours and raised good crops, they and their children received no more food or clothes than men who were unable or unwilling to put in more than a few hours' work a day.

Women rebelled when ordered to cook for men not their husbands, or when requested to wash their clothes. And what about the husbands of women who had been set at these jobs? Their wives, they growled, were little better than slaves, and many men declared they wouldn't permit their womenfolk to do that kind of work.

After months of bitter complaints, the Governor and chief men of the Colony came to the conclusion that they were making a bad mistake. As Governor Bradford said, they *had* thought they were "wiser than God."

And so, in 1623, they turned away from government dictation and gave each family a parcel of land for its own use.

Then what a change took place! Even the women went into the fields willingly, taking their children along with them. All—men, women and children—planted as much corn as they felt they could possibly work.

People who had formerly complained that they were too weak to dig or hoe, declaring that it was tyranny to make them undertake field work, gladly undertook to plant and cultivate for themselves.

And when the harvest was gathered, instead of famine they had plenty. And so they all gave thanks to God. And what a Thanksgiving they celebrated!

No wonder they gave up for all time their sharing of poverty... their belief that it was good for all to suffer scarcity together. They found that it is better for each man to work for himself to produce *plenty*, because that benefits everyone.

* * *

A Free Offer of Special Interest to Parents, Students, Teachers

If you'd like to have Governor Bradford's actual account of why the Pilgrim Fathers celebrated this early Thanksgiving—in his own words and his quaint, old-fashioned spelling—mail a post card to "ThanksgivingEditor" care of The International Nickel Company, Huntington, West Virginia.

Huntington Works
THE INTERNATIONAL NICKEL COMPANY, INC.
Huntington, West Virginia

133 Stainless and Monel Metal Wire Ropes Now Available

STAINLESS Steel and Monel Metal Wire Ropes are becoming more popular where corrosion affects uncoated carbon steel and galvanized ropes, says manufacturer.

★ ★ ★

ONE hundred thirty-three different sizes and types are catalogued in new folder number 49-30 released by **Macwhyte Company**, wire rope manufacturers.

★ ★ ★

TYPICAL uses for each rope are listed and the various types available are described and illustrated.

★ ★ ★

A COPY of this folder is offered to anyone interested in corrosion-resisting wire rope. Ask for folder 49-30. Write to Macwhyte Company, attention R. G. Diehl, Kenosha, Wisconsin (or to this publication).

★ ★ ★

Detroit Steel Buying Portsmouth Steel

DETROIT STEEL CORPORATION of that city and **Portsmouth Steel Corporation** of Portsmouth, Ohio, have announced the conclusion of an agreement by which the Detroit company will acquire the physical assets and the steel business of the Portsmouth company on January 1, 1950. The agreement calls for large-scale expansion of Portsmouth Steel's present finishing facilities.

★ ★ ★

PORTSMOUTH Steel's properties include extensive steel producing facilities located on the Ohio River at Portsmouth, Ohio, and two coal mines in eastern Kentucky. The Portsmouth works include 108 by-product coke ovens, a blast furnace, and ten open hearth furnaces which have an annual ingot capacity of 720,000 tons, supplemented by a blooming mill, billet, rod and wire mills and equipment for the production of manufacturers' and merchants' wire products.

★ ★ ★

DETROIT Steel Corporation owns and operates cold rolled strip mills at Detroit, Michigan, and New Haven, Connecticut, with a combined annual capacity of 210,000 tons. Its Reliance Steel Division processes and distributes flat rolled steel products including the product of its own mills with warehouses in Detroit, Cleveland, Chicago and New Haven. Its Craine-Schrage Steel Division operates a general steel warehouse in Detroit, specializing in cold drawn and hot rolled carbon and alloy steel bars, tool and die steel, etc.

★ ★ ★

THE facilities, management and personnel of Detroit Steel and Portsmouth Steel are to be consolidated into a single corporate unit, without interrupting the continuity of Portsmouth Steel's operations. The 1948 sales of the two companies totalled $88,639,000.

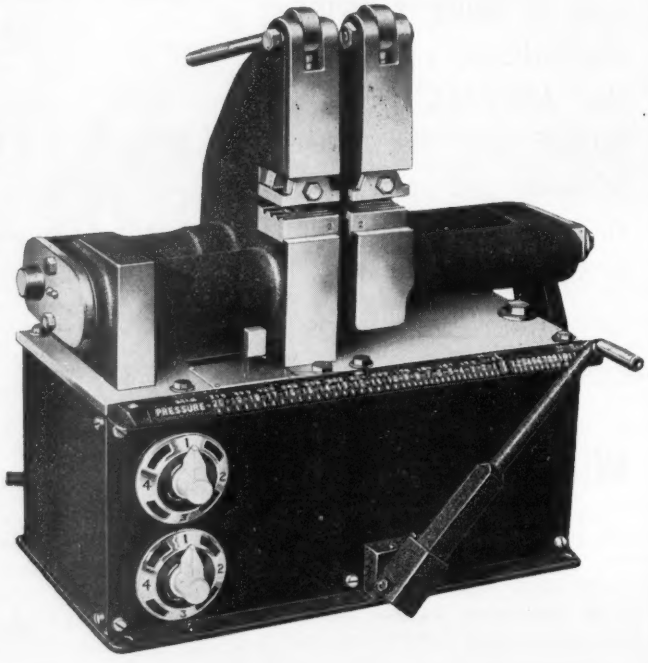
MICROMETER PRECISION — MICRO-WELD — TRADE MARK REG. U. S. PAT OFF.

MODEL T-L MICRO-WELD BUTT WELDER

Welding capacity .080" to .375 diameter STEEL wire

The Model T-L Welder which is a self-contained unit suitable for various types of Butt welding, is equipped with individual hand clamps, and a single control lever for the spacing operation, applying the upset spring tension, and contacting the welding switch.

This unit can be supplied for either bench mounting, overhead crane, or mounted on 4-wheel truck.



MICRO PRODUCTS COMPANY

20 NORTH WACKER DRIVE,
CHICAGO 6, ILL.
Telephone: STATE 7468

THE new mills are scheduled for completion late in 1950. Together with the existing wire mill and wire fabricating equipment, they will utilize all of Portsmouth's present ingot capacity. Consolidation of the steel producing and distributing facilities of these two non-competing units will result in a well balanced and completely integrated steel operation.

★ ★ ★

PORTSMOUTH will continue as a separate corporation with substantial working capital, and will retain its minority stock interest in Detroit Steel Corporation, and its present holdings in raw material companies.

★ ★ ★

Patents Granted to International Nickel on New Cast Iron That Bends

INDUSTRY now has available to it a new cast iron which, unlike ordinary cast iron, is not brittle but can be bent or twisted. This astounding new material can be made readily and economically and can be used in a myriad of applications, thus affording countless economies throughout the industrial world. It is probably the most outstanding metallurgical development in the foundry industry since around 1820 when **Seth Boyden** first made, from cast iron, the American type of malleable iron at Newark, N. J. The novel product, popularly known as ductile cast iron, has several times greater strength than ordinary cast iron with greatly increased ductility and shock-resistance.

★ ★ ★

THESE facts were made known by **Don Reese,** well-known foundry expert and engineer, before the annual meeting of the **Gray Iron Founders' Society** in announcing that the United States Patent Office has recognized the meritorious nature of these inventions by granting Patent Nos. 2,485,760 and 2,485,761 to the **International Nickel Company.**

★ ★ ★

REELS made of

RETURNABLE AND NON-RETURNABLE **WOOD**

12" to 96" in diameter
for complete reels and

REEL HEADS FOR STEEL DRUMS

Bridge SHIPPING and SHOP REELS are furnished assembled or knocked down, made to your specifications. Built to withstand severest handling. Sturdy, strong, low in cost. Made for

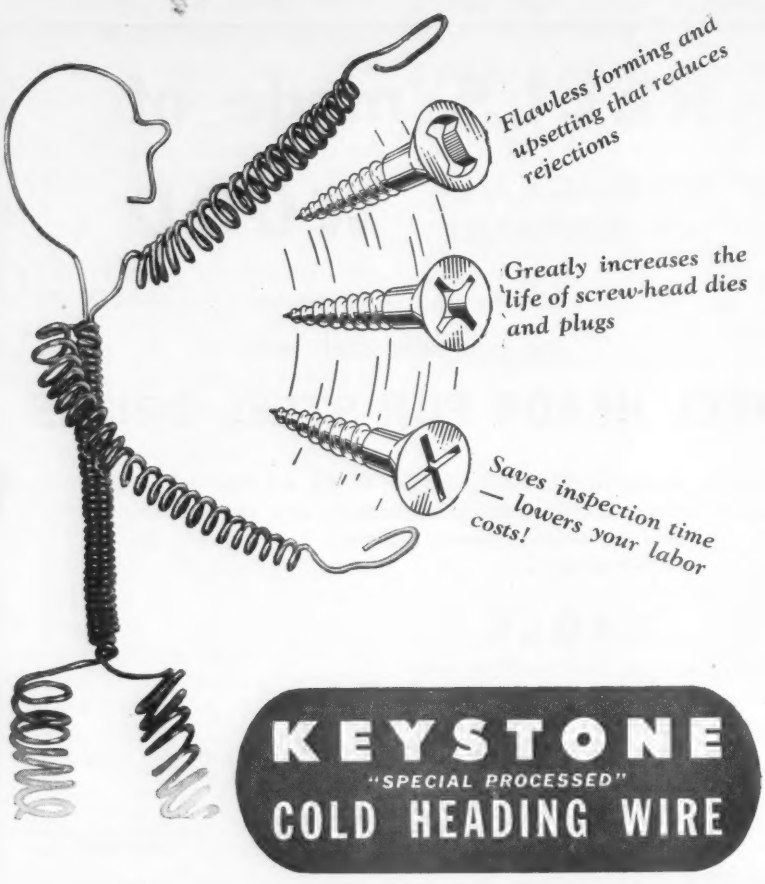
CABLE,
ROPE and
WIRE

and delivered anywhere within a radius of 200 miles of Hazardville by means of Bridge trucks.

This service includes over-night delivery of reels, in case of urgent need, direct to your plant. You are invited to avail yourselves of this unique and convenient facility.

Send us your specifications and let us quote on costs.

BRIDGE MFG. CO., Inc.
HAZARDVILLE • CONNECTICUT


Flawless forming and upsetting that reduces rejections
Greatly increases the life of screw-head dies and plugs
Saves inspection time — lowers your labor costs!
KEYSTONE
"SPECIAL PROCESSED"
COLD HEADING WIRE

For recessed heads, Keystone's new special-process wire delivers the desired upsetting and die forming qualities with such a high degree of uniformity that finished product rejections are practically eliminated . . . individual inspection of screws is no longer necessary . . . die and plug life are often more than doubled. This new wire effects considerable savings in the production of Phillips head, clutch head and cross recessed head screws.

Keystone is prepared to help solve any of your industrial wire problems. If special treatment is called for, Keystone's metallurgical research and testing facilities are available to supply the answers. We welcome your inquiry.

KEYSTONE
STEEL & WIRE CO.
PEORIA . . . ILLINOIS

Special Analysis Wire, Setting New Standards of Performance

Carboloy Development of Interest to Bolt and Rivet Manufacturers

CARBOLOY COMPANY, INC., Detroit 32, Michigan, has announced the availability of carbide heading hammers made with any markings specified by the customers.

★ ★ ★

THESE heading hammer nibs are said to offer twenty times the life of steel hammers and have the further advantage that when the markings begin to show signs of wear, they can be re-ground for a new cycle of operation.

★ ★ ★

THIS development enables bolt and rivet manufacturers to mark their products at negligible cost for the carbide heading nibs in view of the greatly extended service that may be expected.

★ ★ ★

New Bulletin Describes Laboratory Equipment

NO. 49-10-36, an issue of the Eberbach Announcer, was recently published. It contains descriptions of various types of equipment used in laboratories and a short article—"The Analysis of Gases." This covers the history of the subject and sets forth modern trends in analyzing and testing gases. A copy of the publication will be sent upon request by **Eberbach & Son Company,** Ann Arbor, Michigan.

★ ★ ★

Handbook on Fastening Specialties

A NEW 28-page manual features full descriptive and engineering data on the broad range of Southco Blind Rivets, Anchor Nuts, Panel Fasteners, Door-Retaining Springs, etc. and various newly-developed items. Applications are practically limitless throughout industry in fastening metal-to-metal, metal-to-plywood and many other combinations. Copies available on request from **South Chester Corp.,** Finance Bldg., Phila. 2, Pa.

★ ★ ★

New Forms of Teflon Developed

THE DU PONT COMPANY has discovered new forms of "Teflon" tetrafluoroethylene resin, one of its outstanding plastics developed during the war. These new forms will enable chemical, electrical and other industries, for the first time, to take full advantage of the material's extreme resistance to chemical corrosion and its ability to withstand high temperature.

★ ★ ★

RECENTLY Du Pont research men discovered that "Teflon" could be made as a suspensoid, a form in which fine particles of the plastic are held suspended in a liquid. This led to equally important discoveries—how to make "Teflon" adhere to metals and how to make finishes that could be sprayed. Out of this new suspensoid form of "Teflon", five new finished product developments have been evolved, two of which are expected to have considerable interest to the wire industry. They are:

1. **Industrial finishes which may be applied with paint-spraying equipment to metals and thus, for example, may be used to give chemical tanks corrosion-resistant linings.**
2. **Enamels for insulating fine wire which can be coated at a rate of about 50 feet a minute on standard wire-coating machinery, for use in electric motors, transformers and generators.**
3. **Compounds for extruding heavier insulation onto wire at rates upward of 20 feet a minute in contrast with the present rate of six feet an hour.**
4. **Unsupported "Teflon" film of improved quality and in thinner gauges.**
5. **Glass fabrics coated with "Teflon".**

★ ★ ★

IN addition, the suspensoid is offered by Du Pont as a raw material which will find many other uses.

★ ★ ★

AS an indication of the value of the new forms to the chemical and electrical industries, it was pointed out that the plastic will resist the attack of virtually all chemicals, except molten alkali metals, up to 500 degrees F. Because of its heat-resistance, "Teflon" insulation on electric motors makes it possible to raise their power capacities substantially without increasing their size.

★ ★ ★

It's New!

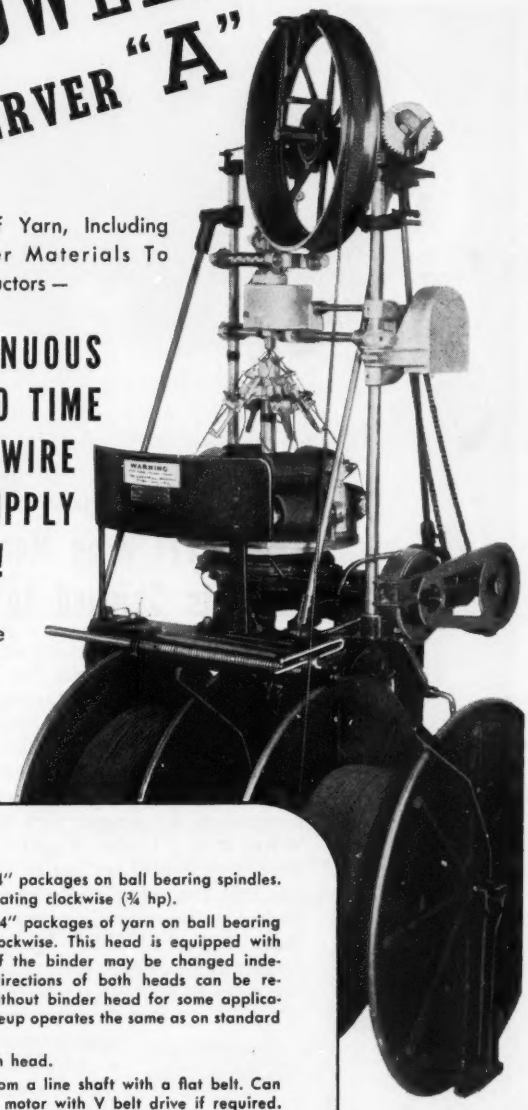
WARDWELLIAN®

YARN SERVER "A"

Applies Multiple Ends of Yarn, Including Glass Fibre and Other Materials To Electrical Conductors —

SERVES CONTINUOUS LENGTHS . . . NO TIME LOST CUTTING WIRE TO DON NEW SUPPLY PACKAGES!

Here is the answer to the demand for a flexible type serving machine for wire and cable.



Features Include:

A main head carrying eight 4" packages on ball bearing spindles. Head driven at 500 rpm, rotating clockwise (¾ hp).

A binder head carrying two 4" packages of yarn on ball bearing spindles, rotating counter clockwise. This head is equipped with change gears so that lay of the binder may be changed independently of main head. Directions of both heads can be reversed. Can be furnished without binder head for some applications. Supply windup and takeup operates the same as on standard Wardwell Braider.

Electrical stop-motion on each head.

Equipped for transmission from a line shaft with a flat belt. Can be furnished with individual motor with V belt drive if required.

Maximum material diameter applicable is ⅜".

Use The Wardwellian Yarn Server "A" for covering:

Type R wire in smaller sizes.

Building or code No. 14 to No. 4.

S. J. Cords

Telephone color cord for identification or any wire where a double serve jacket is used.

COMPLETE DETAILS ON REQUEST!

WARDWELL BRAIDING MACHINE CO.

Central Falls Rhode Island, U. S. A.

Representatives for Europe, British Colonies and Dependencies

JAMES MACKIE & SONS, LTD., BELFAST, IRELAND

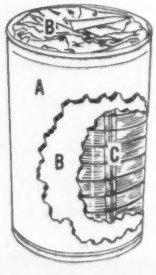
Wallace Barnes-Another VPI® user Cuts Packaging Costs with VAPOR rust preventive!

Angier VPI Wrap Means No Slushing of Coils Shipped to Perfect Circle

When Wallace Barnes Company eliminated slushing expensive steel coils for its exacting customer, Perfect Circle, it also eliminated need of wrapping individual coils with heavy greaseproofed paper! Now Perfect Circle has no degreasing to do — no unwrapping of individual coils. Reason: Wallace Barnes has adopted the proven VAPOR method of complete rust prevention. It's Angier VPI Wrap!

What it is. Under Angier's rigid control, selected packaging papers are coated with the "magic" chemical VPI, the volatile corrosion inhibitor perfected by Shell Development Company.

How it works. Fibre container (A) is lined with Angier VPI Wrap (B). The VPI coating slowly vaporizes to form an invisible protective film around the steel wire (C). Complete protection against rust is assured—even if drums are stored for months! VPI leaves no residue; coils are always clean and ready for instant use.



FOR PROOF of how vapor is cutting costs in 17 different industries, write today for our new booklet shown below.

ANGIER Corporation
Framingham 3, Massachusetts
Industrial Packaging Engineers Since 1895

FREE — "Industrial Applications of Angier VPI Wrap"

Also Angier Spiral Wraps and Spiral Wrapping Machines

Technical Bulletin Describes Unique Industrial Clamp

A NEW two-color technical bulletin, designed for industrial personnel engaged in engineering, development, maintenance and production activities, describing a new and unique industrial clamp has just been released by the **Hunter Spring Company**, Lansdale, Pa.

★ ★ ★

ENTITLED "Neg'ator Clamps for Industry", it discusses the new type of clamp from three aspects: (1) principles, (2) characteristics and (3) applications.

★ ★ ★

THE unusual attributes of the clamp are set forth as: (1) automatic take-up, (2) enormous extendability, (3) flexibility of fit to work, (4) constant pressure regardless of thickness clamped, (5) coil-form heads, and (6) long life.

★ ★ ★

THE section on applications is made up of 10 photographs which show the Neg'ator clamp in typical uses. They cover clamping problems all the way from the office to the laboratory to the shop.

★ ★ ★

THE bulletin also includes a price list for standard stock sizes. Sizes have been selected according to a preferred number series recommended by the American Standards Association. Special sizes can be had on request.

★ ★ ★

THE bulletin (No. 310-1C) will be sent free upon request addressed to Mr. Ralph P. Coleman, Jr., Hunter Spring Company, 1 Spring Avenue, Lansdale, Pa.

★ ★ ★

Packaging Savings with Vapor Rust Preventive Are Cited

INDUSTRIAL applications of vapor to prevent rust is outlined for the first time by the **Angier Corporation**, Framingham, Mass., manufacturer of Angier VPI Wrap. 24 pages with photographs explain how various industries now use this simplified method of packaging for domestic and export shipments of aluminum and steel, including coils.

★ ★ ★

Outstanding Personalities of the Wire Industry

Dr. C. K. Banks Made Director of Research for Metal & Thermit

C. K. BANKS has been named Director of Research of the **Metal & Thermit Corporation,** New York.

★ ★ ★

DR. BANKS is the author of a number of publications on various subjects including organometallic compounds, tropical diseases, sulfa and sulfone drugs, and analytical methods.

★ ★ ★

HIS headquarters will be the Metal & Thermit Research Laboratory at Woodbridge, N. J.

★ ★ ★

Fiberglas Names New Branch Managers

APPOINTMENT of new branch managers to head the Fiberglas sales offices in New York, Chicago and Detroit has been announced in Toledo by **Ben S. Wright**, vice president **of Owens-Corning Fiberglas Corporation.**

★ ★ ★

NAMED branch manager in New York was **Harold D. Bates,** formerly general merchandising manager of Philip Carey Mfg. Co., Cincinnati. Prior thereto he was in sales, advertising and merchandising work in New York with Johns-Manville Corp.

★ ★ ★

RUSSELL R. GALLOWAY was appointed manager of the Chicago branch office. Mr. Galloway was formerly president of Smith Asbestos Company, Milington, New Jersey, and earlier was vice president of Certain-teed Products Corp.

★ ★ ★

JOHN J. HARTNETT was named manager of the Detroit branch office. Mr. Hartnett was formerly general sales manager of the Certain-teed Products Corp., and prior thereto he was a district and division manager of United States Gypsum Co.

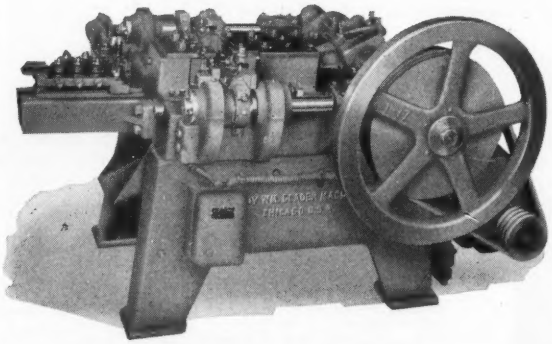
★ ★ ★

E. J. de Ridder Joins Reynolds Metals

E. J. DE RIDDER, prominent European engineer, recently became a member of **Reynolds Metals Company's** staff of Technical Service Engineers, according to an announcement by **David P. Reynolds,** vice president and manager General Sales Division of the company. Mr. de Ridder has been assigned to aluminum design work on which he is a recognized authority. His headquarters will be at 2500 South Third Street, Louisville, Ky.

★ ★ ★

GLADER HIGH SPEED WIRE NAIL MACHINE



MACHINE ARRANGED FOR INDIVIDUAL MOTOR DRIVE

High tonnage output, and low maintenance costs, have resulted in Glader Machines being accepted as standard equipment in every large nail mill built in the United States in the past twenty years.

Glader Machines are operating in most of the wire producing mills throughout the world.

These machines are made in eleven different types and sizes. This enables us to cover the range of sizes of nails produced with the greatest efficiency.

For further information please address,

WM. GLADER MACHINE WORKS
210 No. Racine Ave.
Chicago 7, Illinois

Export Dept.: 122 E. 42nd Street, New York 17, N. Y.

J. F. Berger, Manager Sales Industrial Wire Products Division, John A. Roebling's Sons Company, Trenton, N. J.

Roebling Appointments

F. G. Hoyt, general manager of the Woven Wire Fabrics Division, **John A. Roebling's Sons Company,** Roebling, N. J. announces the appointment of **J. F. Berger** as manager of sales for industrial wire products and **Samuel K. Hornor,** manager of sales for hardware products. The promotions are in line with the Division's new merchandising plan of complete service in two operations.

★ ★ ★

MR. BERGER, who is widely known in industrial circles, has been associated with the Roebling Company for over thirty-five years. His entire years of service have been spent in the woven wire fabrics field.

★ ★ ★

MR. HORNOR has served Roebling in various sales capacities for twelve years and brings to his new position a wealth of experience in handling hardware products.

★ ★ ★

Finnell to Represent Phelps-Dodge on Coast

H. F. FINNELL, JR., has been named Pacific Coast Sales Manager for the **Phelps Dodge Copper Products Corporation,** according to announcement by Wylie Brown, Chairman of the Board.

★ ★ ★

S. K. Horner, Manager Sales Hardware Products Division John A. Roebling's Sons Co., Trenton, N. J.

MR. FINNELL is making his headquarters in Los Angeles. Phelps Dodge Copper Products Corporation is one of the largest fabricators of copper in the United States, with mills at Los Angeles, Elizabeth, N. J., Yonkers, N. Y. and Fort Wayne, Indiana.

★ ★ ★

Hydraulically Operated **TRAVERSE REELS**

FOR FLAT WIRE AND NARROW STRIP

• The self-contained, compact SECO Traverse Reel has smooth, powerful hydraulic operation — at speeds from 150 to 600 feet per minute.

PERFECT SPEED CONTROL from zero to top running speed through flow control.

ACCURATE TENSION CONTROL through pressure regulation.

Built in sizes for coils weighing up to 600 lbs., for round or flat wire. Unit shown occupies floor space 24" x 42". Modifications in design and construction to meet specific requirements.

WIRE SPOOLERS

Single and Multiple Type

Speeds Up To 4,000 feet per minute

STEEL EQUIPMENT CO.

SECO 2890 EAST 83rd STREET CLEVELAND 4, OHIO

Leland T. Weller, Carboloy Specialist for G-E Apparatus Dept., Retires

LELAND T. WELLER, Carboloy specialist for the General Electric Company's Apparatus Department, retired October 1 after more than a quarter of a century of service.

★ ★ ★

A 1949 graduate of the company's apprentice training course, Weller in early years worked as a machinist, a toolmaker, and a tool and gage specialist. As a toolmaker in the Turbine Department, he became interested in carboloy in the early 30's when the material was first entering the metalworking field.

★ ★ ★

HE was subsequently transferred to the managers staff of the G-E Schenectady Works and then to the Works Laboratory to continue development and application of this new machining medium. After carboloy was developed to a point of considerable efficiency, Weller did much of the ground work in finding ways of integrating it with manufacturing processes and training operators to use it.

★ ★ ★

IN 1945, he was tranferred to the Methods and Equipment Division, where, as carboloy co-ordinator for the Apparatus Department, he furthered the use of carboloy tools in all types of applications.

★ ★ ★

NATIONALLY recognized as an expert in his field, Weller has frequently lectured before professional societies and in training courses in carbide application at several collges. He is a member of the American Society of Tool Engineers, the tool committee of the American Society of Mechanical Engineers, the American Society of Metals, and the G-E Foremen's Association.

★ ★ ★

G. E. Appointments

F. E. SATTERTHWAITE has been appointed quality control engineer of the plastics division in the chemical department of the **General Electric Co.**, Pittsfield, Mass. In 1946 Dr. Satterthwaite came to the company as quality control engineer in the fractional horsepower motor engineering division at Fort Wayne, Ind. **G. K. Iwashita** has been named manager of product planning in the company's air conditioning department in Bloomfield, N. J. Prior to his appointment, Mr. Iwashita was manager of product research of the Seeger Sunbeam Corp., Evansville, Ind.

★ ★ ★

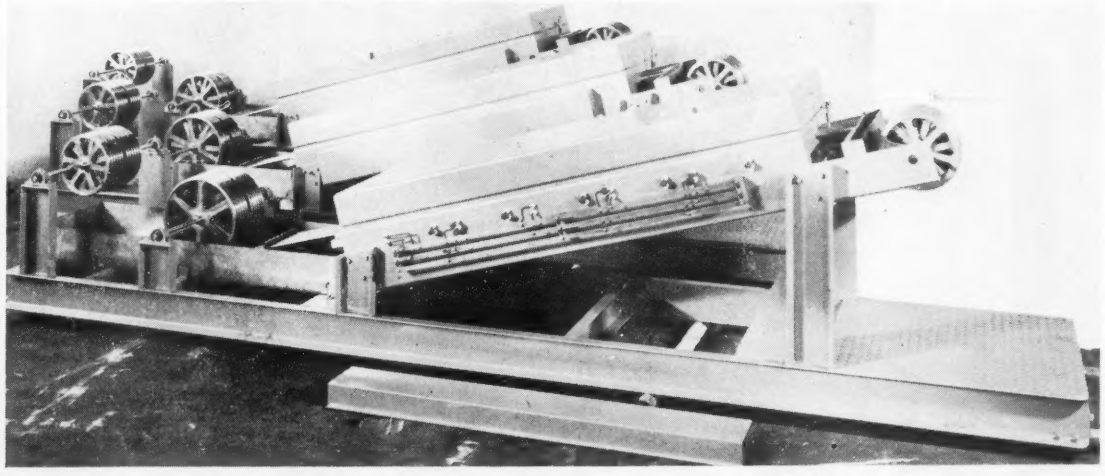
Y. & T. Adds to Staff

PHILIP B. NILES has been elected a vice president of **The Yale & Towne Manufacturing Company**, it was announced by Gilhert W. Chapman, president.

★ ★ ★

MR. NILES joined Yale & Towne on November 7, and

CONTINUOUS WIRE ANNEALERS



Combine annealing with your copper wire enameling operations by installing an "AIMCO" Type CW electric heated pre-annealer.

Standard models for up to 20 lines of wire.

Especially recommended for installations operating at comparatively low oven temperatures insufficient to anneal the wire during the enameling process.

Send for Description

EST. 1883 AIMCO INC. 1918
"American" AIMCO INSULATING MACHINERY COMPANY
517 West Huntingdon Street
Philadelphia 33, Pa., U.S.A.

will devote his attention to marketing and to the development of executive personnel throughout the company. He has been public relations director for the Owens Illinois Glass Company, Toledo, Ohio, since early in 1948, and had previously been vice president of the American Water Works Company.

★ ★ ★

HE was a reporter for the Wall St. Journal for two years, leaving in 1924 to go with the American Water Works & Electric Co. with which he served in various capacities, including sales promotion, marketing research, advertising and employee relations, and rising to become assistant vice president. In 1947, when the American Water Works Company was separately organized, he became its vice president. At Owens Illinois Glass Company his responsibilities included, among other things, directing the sales promotion and advertising for certain of its industrial and consumer products.

Paul Becker to Manage Auto-Lite's New Hazelton Plant

APPOINTMENT of Paul Becker as manager of the new wire and cable plant in Hazleton, Penn., has been announced by **Royce G. Martin,** President of **The Electric Auto-Lite Company.**

★ ★ ★

A 25-YEAR veteran in the wire and cable business, Mr. Becker will direct Auto-Lite's newest plant in the production of automotive and industrial wire and cable.

★ ★ ★

THE Hazleton plant was officially opened October 18 with ceremonies attended by high state and local officials as well as officers of Auto-Lite. The dedication of the plant marks the fulfillment of an unusual community effort on the part of Hazleton citizens who raised more than $500,000 in cash to apply on the construction of the plant building.

★ ★ ★

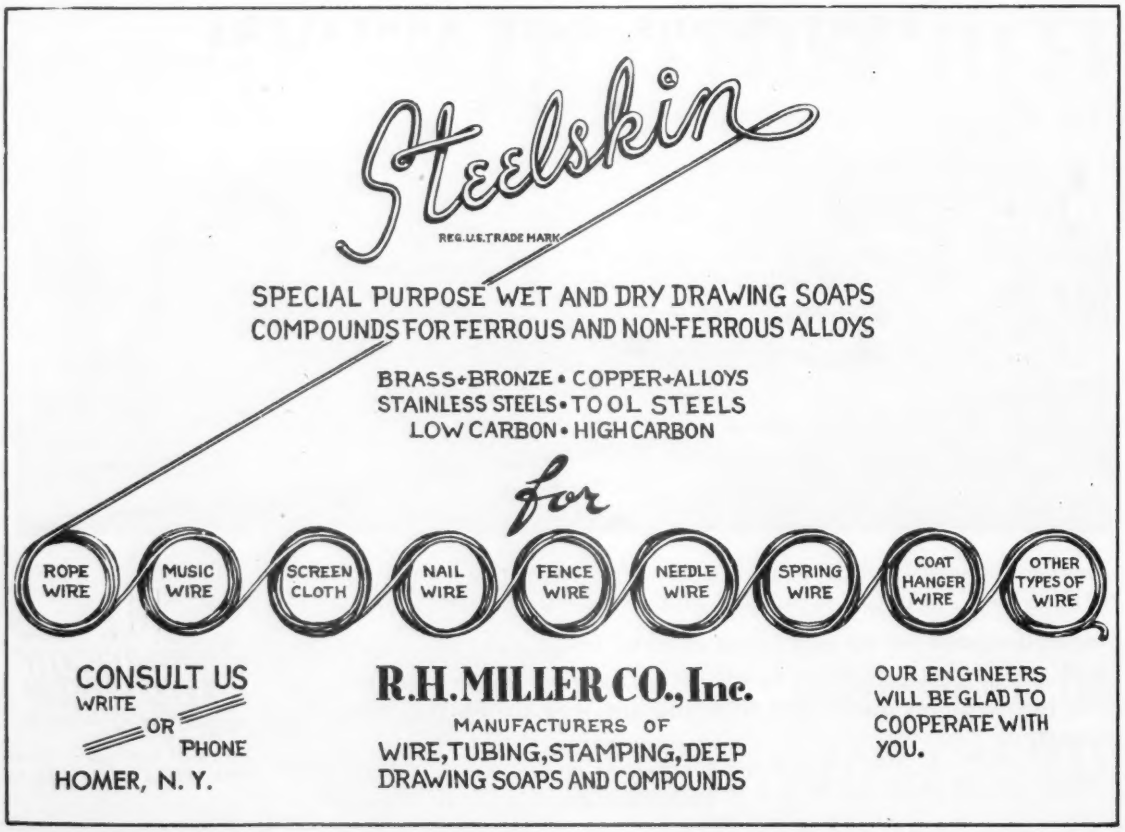
MR. BECKER was for 17 years associated with the General Cable Corporation in Rome, N. Y., in posts ranging up to mill superintendent. During the war, he was assistant general superintendent of Anaconda Wire and Cable Company at Hastings-on-Hudson, N. Y. He has also been associated with the Ansonia Electrical Division of Noma Electrical Corporation, Ansonia, Conn., and the Plastic Wire and Cable Corporation, Jewett City, Conn., in the capacity of factory manager.

☆ ★ ★

Magnus Organizes Company in Canada

OF particular interest to the Canadian wire industry is the announcement by **Magnus Chemical Company,** Garwood, New Jersey, that Magnus Metalcoat No. 267, Metalcoat No. 263, and their complete line of wire drawing lubricants are now available in Canada through **Magnus Chemicals Limited,** 4040 Rue Masson, Montreal 36, Quebec.

☆ ★ ★



MAGNUS Chemicals Limited is an entirely Canadian organization, headed by **Paul Pichet,** President.

* * *

HAROLD L. TREMBICKI, Manager of the Metal Coating Division of Magnus Chemical Company, will act in the capacity of technical advisor for Magnus Chemicals Limited, on all wire drawing activities of that company.

* * *

Glass Fibers, Inc., Elects New Officers

AT a recent meeting of the Board of Directors of **Glass Fibers, Inc.,** Waterville, Ohio, **R. F. Mensing** was elected Vice-President and Treasurer and **F. H. May, Jr.,** Vice-President and Secretary and Assistant to the President. The announcement was made by **R. H. Barnard,** President of the Maumee Valley industrial concern.

* * *

MR. MAY has been engaged in various executive capacities with the corporation since its early days. Mr. Mensing, who came to Glass Fibers in March, 1948 had been director of the Federal and Property Tax Division of United States Gypsum Company at their Chicago headquarters.

* * *

Holden to Be Represented on Coast by L. J. Bohan

THE A. F. HOLDEN COMPANY of New Haven, Connecticut and Detroit 16, Michigan, announces the appointment as West Coast Representative of **Lloyd J. Bohan.**

* * *

MR. BOHAN has been associated with the metal working industries for some fourteen years. The past two years he has been a manufacturer's agent in Southern California, specializing in heat treating equipment.

* * *

Townsend Company Opens Eastern Office

ESTABLISHMENT of a new sales office in the Broad Street Station Building, Philadelphia, was announced recently by **Townsend Company,** New Brighton, Pa., manufacturers of rivets, bolts, nails and special fasteners. The new office, under Edward T. Brown, Sales Manager of the Eastern Division, is designed to facilitate handling of orders from Townsend industrial and jobber customers in that territory which includes New England, New York, New Jersey, Pennsylvania, Delaware, Maryland, West Virginia, the District of Columbia, Virginia and North Carolina.

* * *

R. Y. Ferner to Represent Maschinenfabrik Darnstadt

R. Y. FERNER CO., 110 Pleasant St., Boston 48, Mass., has been appointed by the above company to sell instruments for advanced microscopy in this country.

* * *

Patented

2 BX Mossberg Carrier

MOSSPEED BRAIDER CARRIERS

Represent

Improved Braiding at Lower Costs

The patented MOSSPEED spring tension take-up makes it possible to increase the speed of the maypole-type braiding machine. An effective increase of 80% being obtained in many cases.

The new (x) type MOSSPEED high speed carrier permits the rapid changing of tension springs making this an ideal carrier for braiding all kinds of yarn (cotton, rayon, asbestos, jute), in addition to fine strands of copper wire.

Consult our engineers regarding your braiding problems.

2 SE Copholder

Complete line of both MOSSPEED carriers and metal copholders for all sizes and makes of maypole type braiding machines.

MOSSBERG

Pressed Steel Corp.

Attleboro, Massachusetts, U. S. A.

18 West Street

James Day (Machinery), Ltd., 90 Regent Street, London, W. I., England

A Review of Recent Wire Patents

NO. 2,483,441, PLASTIC COMPOSITION FOR COATING WIRE, patented October 4, 1949 by Howard E. Smith, Brooklyn, N. Y., assignor to Insl-X-Corporation, Brooklyn, N. Y., a corporation of New Jersey.

This insulating coating consists of the following, parts being by weight: A cellulose ether 100, chlorinated diphenyl 20, dibutyl phthalat 10, paraffin wax 2, castor oil 20, triphenyl phosphate 15, solvent 1 to 5. The cellulose ester may be benzyl cellulose or ethyl cellulose.

★ ★ ★

NO. 2,483,865, SINUSOIDAL SPRING FORMING MACHINE, patented October 4, 1949 by Fred R. Zimmerman, Davenport, Iowa, assignor to Nichols Wire and Steel Company, Davenport, Iowa, a corporation of Iowa.

Employing spring wire stock, the machine forms an elongated flat spring. There are 14 claims.

★ ★ ★

NO. 2,483,915, INSULATING-TESTING APPARATUS, patented October, 4. 1949 by Harold A. Lines, Hamden, Conn., assignor to The Whitney Blake Company, Hamden, Conn., a corporation of Connecticut.

The apparatus is adapted to test insulated wire by causing the wire to travel past a testing electrode with the outer surface of the insulation close enough to result in a flow of current between the wire and electrode through a defect in the insulation.

★ ★ ★

NO. 2,484,178, WIRE ROPE MAKING MACHINE, patented October 11, 1949 by William T. MacCreadie, Lewisburg, Pa., assignor, by mesne assignments, to Sunbury Wire Rope Manufacturing Company, Sunbury, Pa., a corporation of Pennsylvania.

This machine includes a wind-up bobbin unit comprising a pivotally supported bobbin cradle, a wind-up bobbin shaft rotatively mounted in the cradle, a bobbin carried by this shaft and rotatable therewith, a drive gear rotatively mounted upon and arranged concentrically with respect to the bobbin shaft, an actuator shaft mounted in the cradle, a rope-guide-member mounted to be reciprocated by the actuator shaft, so as to deliver rope to the bobbin, a counter shaft operatively connecting this drive gear and the actuator shaft, a device for counterbalancing the guide member, means for imparting independent rotative movements to this drive gear, and a device for controlling the speed of rotation of the drive gear.

Complete Description and Drawings of Patents May Be Had for 50 cents, outside the United States and Canada $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

★ ★ ★

NO. 2,484,179, WIRE ROPE MANUFACTURING MACHINE, patented October 11, 1949 by William T. MacCreadie, Lewisburg, Pa., assignor, by mesne assignments, to Sunbury Wire Rope Manufacturing Company, Sunbury, Pa., a corporation of Pennsylvania.

Here the assembly includes an elongated cradle rotatively mounted upon its longitudinal axis, a wind-up bobbin, a cam drum and a haul-off drum rotatably supported in the cradle upon axes disposed transversely of said cradle and in spaced relation to one another, power means supported by and located on one side of the cradle for rotating the bobbin and the cam drum, and power means supported by and located upon the opposite side of the cradle for rotating the haul-off drum.

★ ★ ★

NO. 2,484,282, WIRE STRANDING DEVICE, patented October 11, 1949 by Otho L. Giffin, Worcester, Mass.

In this wire strand twisting machine, there is a strand guiding head, includ-

The SPECIALISTS in
Wire - Straightening and Wire - Cutting!

Diameter Range — 1/16" to .005"

PRECISION - Our Motto

DON'T hesitate to call on us when you are confronted with wire-straightening problems involving close tolerances and absolute accuracy. For seventeen years we have specialized in straightening and cutting all gauges of fine wire, hard or soft, ranging in diameter from one-sixteenth of an inch down to five-thousandths of an inch. We employ gun-barrel accuracy in straightening lengths from one inch to ten feet or any fractional part thereof. Ends cut absolutely clean without burrs.

ASK ABOUT OUR UNEXCELLED FACILITIES FOR CLEANING AND POINTING WIRE ALREADY STRAIGHTENED AND CUT.

ALL TYPES OF WIRE...

- Nickel
- Stainless Steel
- Bronze
- Brass
- Copper
- Alloy Wire
- Music Wire
- Tag Wire
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Write us today!

Manufacturers of the famous ARMA PAPER CLIP

PITTSBURGH CUT WIRE COMPANY
1112-20 GALVESTON AVENUE · PITTSBURGH, PENNSYLVANIA.
TELEPHONE: CEdar 4702

ing a central hub with an even number of strand guide elements circumferentially spaced about the hub and means for rigidly securing one half of a plurality of strand guide elements to the hub, each of the strands passing successively through one of a number of flexibly mounted strand guide elements and a respective one of a number of rigidly mounted strand guide elements.

★ ★ ★

NO. 2,484,644, SELF-LOCKING AND SEALING SCREW, patented October 11, 1949 by Ougljesa Jules Poupitch, Chicago, Ill., assignor to Illinois Tool Works, Chicago, Ill., a corporation of Illinois.

An enlarged root portion of the screw is adapted to lockingly and sealingly impinge the crown of a complimentary thread in a work piece.

★ ★ ★

NO. 2,484,645, SCREW FASTENER, patented October 11, 1949 by Rudolph K. F. Baumle, Chicago, Ill., assignor to Illinois Tool Works, Chicago, Ill., a corporation of Illinois.

This invention contemplates a self-locking and self-sealing screw in which a holding portion is provided with means along the thread convolutions to provide self-locking and complete sealing engagement between the screw and the work.

★ ★ ★

NO. 2,484,705, METHOD OF IMPROVING THE ADHERENCE OF INSULATING COMPOUNDS TO METALS AND PRODUCTS RESULTING THEREFROM, patented October 11, 1949 by Alvin N. Gray, Joppa, Md., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

In order to improve the adherence of vulcanizable insulation, containing copolymers of butadiene and stryene, to copper wire conductors, the inventor incorporates with the insulation some magnesia placing a quantity of the magnesia-containing compound in contact with the copper surface, and vulcanizing the compound while in contact with this surface, the amount of magnesia incorporated in this compound being sufficient to cause the compound to adhere to the metallic body with greater tenacity than would a similar compound devoid of magnesia but not more than about 5% of the amount of the copolymer present therein.

★ ★ ★

NO. 2,484,872, BED SPRING, patented October 18, 1949 by Stephen J. Blaha, De Kalb, Ill., assignor to The Englander Company, Inc., Chicago, Ill., a corporation of Delaware.

This structure includes both coil and helical springs with a new interconnection thereof. There are 9 claims.

★ ★ ★

NO. 2,485,019, LUBRICATED WIRE ROPE, patented October 18, 1949 by Peter P. Somerville, Muncy, Pa., assignor to Jones & Laughlin Steel Corporation, Pittsburgh, Pa., a corporation of Pennsylvania.

The rope comprises wire strands wound together and lubricant comprising an oleaginous carrier containing powdered bearing metal covering the strands to lubricate them with respect to one another and to externally lubricate the rope.

★ ★ ★

NO. 2,485,495, APPARATUS FOR MAKING WIRE-CUTTING GUIDES, patented October 18, 1949 by Thomas F. Kenney and Arthur Bellavance, Lowell, Mass., assignors to Boott Mills, Lowell, Mass.

This invention relates to setting-in guide wires employed in the fustian cutting of corded velvets (as corduroys), and is directed to the wire cutting guides.

★ ★ ★

NO. 2,485,871, INSULATED ELECTRIC WIRE TESTING, patented October 25, 1949 by James L. Entwistle, Cranston, R. I., assignor to James L. Entwistle Co., Pawtucket, R. I., a partnership consisting of Margherita C. Entwistle and James L. Entwistle.

Two nozzles are positioned on opposite sides of the cable for covering the entire surface of the insulating ma-

Wean Equipment Corporation
CLEVELAND, OHIO
THE WEAN EQUIPMENT CORPORATION are recognized as specialists in high-efficiency and wire mill and straightening equipment.
COLD ROLLING MACHINERY
For 36" Wide Material and Narrower
MILLS - REELS - SLITTERS - LEVELERS
COILERS - EDGERS - SCALE BREAKERS - SHEARS
SCRAP BALLERS - CONTINUOUS PICKLING
WIRE MILL EQUIPMENT
PATENTING, GALVANIZING AND TINNING TAKE-UP FRAMES
WIRE FLATTENING MILLS - SPOOLERS - NAIL GALVANIZING AND BLUEING EQUIPMENT - FIELD FENCE AND BARBED WIRE MACHINES
TUBE BAR AND SHAPE STRAIGHTENING MACHINERY
WEAN EQUIPMENT CORPORATION
22800 LAKELAND BLVD. • CLEVELAND, OHIO
No. 1155 Farm and Field Fence Machine
Barbed-Wire Machine
Strip Reel and Slitting Unit
16 Block Wire Galvanizing Take-Up Frame
Entry End of Tube Straightener

terial with a fine spray of water, potentials are applied to the insulation, an electrode unit adjacent said nozzles is provided through which the conductor passes and wherein a testing voltage is applied between the dampened insulation and conductor whereupon a take-up reel adjacent the electrode unit pulls the conductor successively through the space between the nozzles and the electrode unit.

★ ★ ★

NO. 2,485,895, TENSION CONTROLLING APPARATUS, patented October 25, 1949 by Elmer J. Larsen and Oscar G. Nelson, Baltimore, Md., assignors to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

This apparatus is adapted for use with wire strand rewinding machines.

★ ★ ★

NO. 2,485,961, COIL HANDLING APPARATUS AND METHOD, patented October 25, 1949 by Clarence J. Duby, Youngstown, Ohio, assignor to Republic Steel Corporation, Cleveland, Ohio, a corporation of New Jersey.

Coil handling apparatus is disclosed comprising a downwardly inclined runway, a pair of driven rolls extending transversely of this runway between its ends and positioned to receive a coil rolling down the runway, freely rotatable coil supporting means disposed beyond and adjacent to the lower end of the runway, an abutment positioned beyond this means to prevent a coil from rolling beyond the movable means and a device to guide a rolling coil from said driven rolls to the rotatable means.

★ ★ ★

High Speed Wire Straightener

GREATER capacity is designed into the type 3A Shuster wire straightener built by **Mettler Machine Tool, Inc.**, 132 Lawrence St., New Haven, Conn. Almost continuous wire travel, high speed cutoff and absolutely square ends are features of the machine which is capable of straightening from ¼ to ½-inch diameter wire (up to 9/16-inch in soft stock). Type 4A machine handles diameters from ⅜ to ⅝-inch, or up to 11/16-inch in soft stock.

★ ★ ★

THE direct driven, 5-die filer machine has a quiet V-belt motor drive and is equipped with ball and roller bearings throughout. Machine itself is extremely rigid.

★ ★ ★

DuPont Resumes Publication of Technical Bulletin

"MODERN Metal Finishing" is once more being issued by **DuPont Company** as a technical bulletin reporting timely and useful developments in the treatment of metals.

★ ★ ★

THE October, 1949, issue, No. 1, Volume 7, the first since June, 1941, is now being circulated. Six articles and seven illustrations comprise its contents.

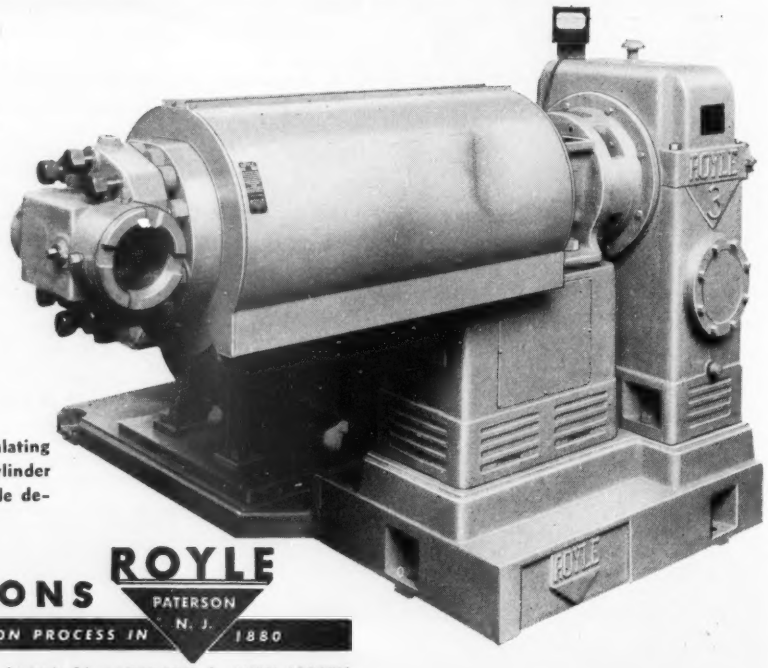
★ ★ ★

"VAPOR Degreasing," describing this modern metal cleaning process, and "Carbonate Removal from 'Coppralyte' Copper Plating Baths," are front-page features of the first issue. Other articles are on sodium hydride descaling; free-washing carburizing baths; vapor cleaning of metal mouldings; and a new copper-plating filter aid.

★ ★ ★

ROYLE *for WIRE INSULATING*

- **Continuous Vulcanizing Machines for Rubber Wire Insulation**
- **Plastic Wire Insulation Machines**
- **Strainers • Cooling Troughs**
- **Light Wire & Cable Capstans**
- **Motorized Take-Ups**
- **Temperature Control Units for Extrusion Processes and other industrial uses**



ROYLE # 3 Plastic Wire Insulating Machine. Double extended cylinder enclosed in insulating jacket, side delivery head.

JOHN ROYLE & SONS ROYLE PATERSON N. J. 1880

PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN

London, England — James Day (Machinery) Ltd. REgent 2430
Home Office — J. W. VanRiper SHerwood 2-8262
Akron, Ohio — J. C. Clinefelter JEfferson 3264
Los Angeles, Cal. — H. M. Royal, Inc. LOgan 3261

PATERSON 3, NEW JERSEY

PLEASE write DuPont's Electrochemical Department, Wilmington 98, Del., if a copy is desired.

★ ★ ★

Standard Steel Spring Buying Falls Spring and Wire

DIRECTORS of **Standard Steel Spring Co.**, of Coraopolis, Pa., and of Falls Spring & Wire Co., of Detroit, have agreed to a plan of acquisition by Standard of Falls Spring, subject to approval of stockholders of both companies, Colonel **Willard F. Rockwell,** Standard Steel Spring president, has announced.

★ ★ ★

FINANCIAL details of the proposed purchase were not disclosed. Standard Steel Spring listed total assets at the close of 1948 of about $25,000,000.

★ ★ ★

FALLS Spring & Wire, incorporated in 1935, has two plants in Detroit, one in Chelsea, Mich., one in Chicago and one in Kansas City, Mo. It is a large producer of cushion springs, mechanical springs and tubular products for the automotive industry. For the first ten months of 1949 its sales totaled approximately $21,350,000.

★ ★ ★

IF the acquisition is consummated, Harry Fante, chairman; Harry Swanson, president, and John P. O'Hara, director of Falls Spring, will become members of the Standard Spring board which will be increased to fifteen from twelve members.

★ ★ ★

PLANTS of Falls Spring will be continued in operation under the existing management and present personnel will be retained, Colonel Rockwell said.

★ ★ ★

THE total square-foot area of plants of the Falls Spring company is 900,000 and some 3,500 persons are employed in all of its operations, according to the announcement.

★ ★ ★

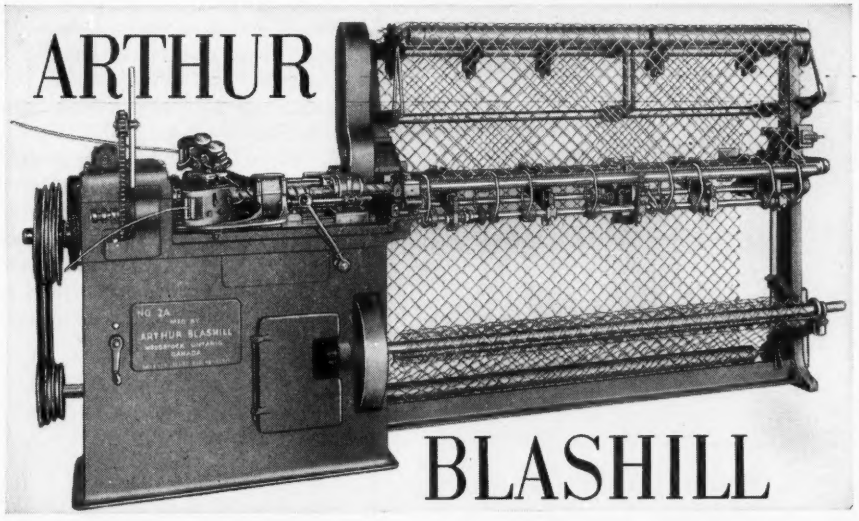
Fidelity Chemical Moves to Larger Plant

FIDELITY CHEMICAL PRODUCTS CORPORATION, manufacturers of industrial metal treating and cleaning compounds for all purposes, has moved to larger quarters at 470 Frelinghuysen Avenue, Newark, New Jersey.

★ ★ ★

GEORGE N. BICK, President, reports that the new plant's 15,000 square feet houses many new facilities for research, testing, and production. These include a pilot plating plant, various types of model spray booths, a special technical library, and greatly increased production facilities for all types of alkaline cleaners, spray booth compounds, paint strippers, and plastic peelable coatings.

★ ★ ★



CHAIN-LINK FENCE
Woven At Pre-war Costs

Weekly output increase 50% or more.

Weaving cost per roll 50% less (power, space, labour saved with bigger output).

Gears of machine cut, hardened Alloy Steel run in oil bath. Bearings Ball or Roller.

Large power saving — 3 h.p. only up to #8 gauge, or 5 h.p. for #6 gauge.

Fast spiral forming—Cushioned 'speed pick-up'.

Quick cut-off and netting advance — Instant, precise clutch action.

Entire "Cut-off" stop under ¾ second—Giving much more weaving time.
Fence rolled near operator—saves him half-mile daily—Gives more production time.
65% factory space saved—Machine only 3 ft. wide.
Constant, reliable and fully automatic operation.
A maker of Chain-Link Fence since 1911 familiar with all machines, after using the No. 2 A several months, writes, —"It is certainly the best machine we have ever seen."

WOODSTOCK, ONTARIO, CANADA (Formerly at Birmingham, England)

FIDELITY, well known for its X-VAR, a fast-acting, non-creeping insulation stripper, manufactures stripping compounds for paints, varnishes, lacquers, synthetics and vinyls; metal treatment and cleaning compounds for iron, steel, aluminum, brass, copper, magnesium, etc.; peelable coatings for spray booths, coated surfaces, plastics, metal products; and cleaning compounds and detergents for industrial, institutional, and transportation maintenance. The company's experienced technical staff and augmented research and testing laboratories are available for solution of individual problems.

★ ★ ★

Youngstown Sheet & Tube Appointments

JAMES W. KIRKPATRICK has joined **Youngstown Sheet & Tube Co.**, Youngstown, as chief metallurgist in the Youngstown district.

★ ★ ★

EUGENE M. Smith has joined the company as flat-rolled products development engineer, located at the Campbell plant.

★ ★ ★

MR. KIRKPATRICK has been assistant metallurgical engineer with H. A. Brassert Co., and had previous association with the Kearney research laboratory, Homestead district works of Carnegie-Illinois Corp., and its Pittsburgh Metallurgical Division.

★ ★ ★

MR. SMITH has been with Battelle Memorial Institute in Columbus, O., where he was a research engineer.

★ ★ ★

Fluxes for Hot Dip Galvanizing and Tinning

THE Hanson-Van Winkle-Munning Company of Matawan, New Jersey, has issued a new Bulletin, F-100, entitled "Why And How to Use H-VW-M Fluxes for Hot Dip Galvanizing and Hot Tinning."

★ ★ ★

THIS is an unusual publication. It is really a technical Instruction Manual in every sense of the word. The Bulletin gives the technical details for the use of H-VW-M No. 20 Fluxes for hot dip galvanizing and the H-VW-M Fas-Tin Flux for hot tinning. It reviews the techniques involved, describing and illustrating the pre-galvanizing cycle, giving a work flow sheet, operation by operation, for hot galvanizing from the first alkali cleaner, through pickling, rinses, fluxing and galvanizing.

★ ★ ★

IN hot tinning, the Bulletin describes the pre-tinning cycle and the use of Fas-Tin fluxes as a wash or a flux blanket.

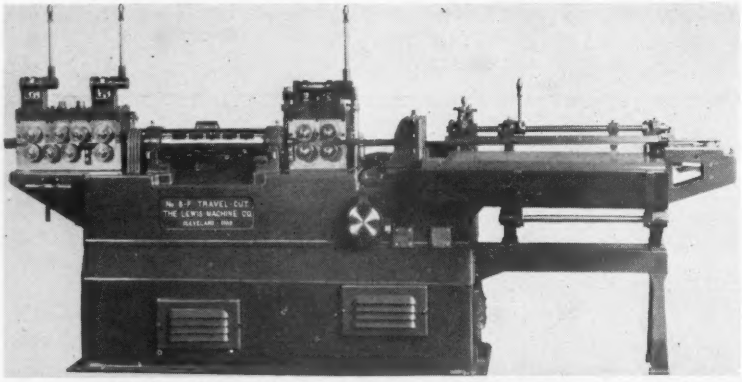
★ ★ ★

THE operator of a hot tinning or galvanizing plant will find this Bulletin of great technical assistance in his operations.

★ ★ ★

CUT YOUR CUTTING COST WITH

LEWIS TRAVEL-CUT



Wire Straightening & Cutting Machines

The simplicity of design and rigid construction of the Lewis Travel-Cut makes it well suited for the most severe high-production requirements. This machine feeds the wire from the coil, straightens, gauges to accurate length, and cuts while in motion thus producing uniform diameter rod free of arbor swell and feed roll marks. It is particularly adapted to precision work on bright finished steel, brass, aluminum, stainless, and alloy wire. This method of cutting is also very efficient for short lengths such as welding rod, special bolts, etc., and increases the over-all efficiency approximately 20% over the conventional type of cut-off.

Machines built in various sizes to handle from 1/16" up to 3/4" diameter, and 1/16" to 5/8" square or equivalent area in hexagon and flat.

Exclusive Representatives

EAST: Penn Machinery Company, 117 North Third Street, Philadelphia 6, Pennsylvania.

MIDDLE WEST: Steel & Wire Machinery Company, 1017 Helmsdale Road, Cleveland 12, Ohio.

CENTRAL: Moslo Machinery Company, 2443 Prospect Avenue, Cleveland 15, Ohio.

CANADIAN: Empire Engineering Company, 11 Wellington Street East, Toronto 1, Ontario.

CONTINENTAL EUROPE: Gaston E. Marbaix, Ltd., Devonshire House, Vicarage Crescent, London S.W. 11, England.

Also agents in Paris, Stockholm, Rotterdam, Brussels, Zurich, Milan, Bombay and Melbourne.

The LEWIS MACHINE Co.
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Japanese Anneal, Harden, Temper Wire by Direct Resistance Heating

IN a recent issue of **Kagaku Chishiki,** Professor **Tadao Sano,** of Kyusha University, gives an account of recent Japanese methods of producing wire of high toughness and dimensional accuracy for the manufacture of card clothing.

★ ★ ★

CARD clothing is the "comb" used to straighten out the fibers in raw cotton prior to spinning. It consists of barbs of 0.30 to 0.31 mm diameter steel wire, about 20 mm long, arrayed on a cloth base. Because of the severe flexion to which the wire barbs are subjected in the combing process a wire material of extraordinary toughness, resilience and tenacity is required to give complete recovery from deflection in long periods of use. Uniform mechanical behaviour of the wire barbs is another important requirement. This is conditional on uniformity in diameter and metallurgical structure of the barbs.

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THE usual Japanese practice is to anneal rod of 0.5 to 0.6% C. for 20 to 30 hours in a pot, to descale with acid, to neutralize with lime and to wash with water. The wire is then drawn, in one or two reduction stages, to the required gauge. It is then either hardened and tempered, or austempered. The wire is now ready for cutting.

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THIS procedure involves not only considerable loss of wire through breakage in drawing and imperfections of the drawn wire, but the final product is also of unpleasant appearance.

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WASTE has been running as high as 55 to 60 per cent, but has been cut to 8 to 10 per cent by improved practices. One cause of waste is the lack of uniformity in annealing, producing a wire of spotty strength characteristics. This is reflected in the final product's lack of dimensional uniformity.

★ ★ ★

IN the normal Japanese production setup, the wire passes through an air seal and is brought to hardening temperature by resistance heating, then runs through an oil hardening bath, through a nichrome electric induction tempering furnace and finally through cooling water to the receiving coil. The passage tube in the nichrome tempering furnace has an internal diameter of 10 mm and a length of 800 mm. The wire treated by this method exhibits oxidation colors ranging from yellow to blue and purple.

★ ★ ★

THIS discoloration has been successfully eliminated by saturating the thin passage tube in the electric furnace with oil vapour. However, solid oil residues tend to accumulate in the tube and must be cleaned out from time to time to avoid contamination of the wire. Also this arrangement is

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not fully satisfactory because the wire is not uniformly heated while passing through the tempering furnace. This is partly due to inevitable lateral movements of the wire and partly due to the fact that there are temperature differences in the interior and on the surface of the wire.

★ ★ ★

THESE difficulties have been overcome by application of the patenting process. The resistance-heated wire is passed through a lead bath of 420 to 430°C. at the rate of 40 metres a minute (compared with 30 metres by other processes.) The wire so treated is not only free of discoloration after cooling in water, but is uniform in strength and hardness and its toughness is about three times that of a hardened and tempered wire. The lead bath used in Japan has a length of 600 mm and only a single wire is treated at a time. Construction of multiple-wire baths is under consideration.

★ ★ ★

A FURTHER modification has been devised, originally to meet the periodical power shortages which made continuous operation of a nichrome tempering furnace difficult. As in the hardening procedure, the electric current is fed directly into the wire for tempering by resistance heating. This method has the additional advantage of producing a wire of more uniform metallographic characteristics than is possible by heating in the tempering furnace. Oxidation is inhibited by oil vapor.

★ ★ ★

HITHERTO it has been the practice to anneal the wire rod in a large pot furnace at 650°C. Such furnaces have only a relatively narrow zone of uniform heat. Overcharging of the furnace leads to unevenness in strength, which is the cause of ruptures in the subsequent drawing operation. Furthermore, the wire remains black after descaling and it is therefore necessary to apply a second acid treatment (hydrochloric acid) and neutralization before drawing. Again, direct resistance heating has provided the answer to the problem, according to Professor Sano. However, very careful time and temperature control is necessary because the wire may otherwise break during this treatment. On the other hand, failures on the drawing bench are entirely eliminated, at least in two-stage drawing.

★ ★ ★

JAPANESE research workers are now thinking of electropolishing the finished wire and also of devising a means of hardening the barb tins.

★ ★ ★

W. J. Sparling Appointment

WILLIAM J. SPARLING has been newly elected vice-president and manager of the chain and transmission division of **Chain Belt Co.**, Milwaukee. Mr. Sparling joined the company in 1928 and has served in various capacities, most recently as works manager.

★ ★ ★

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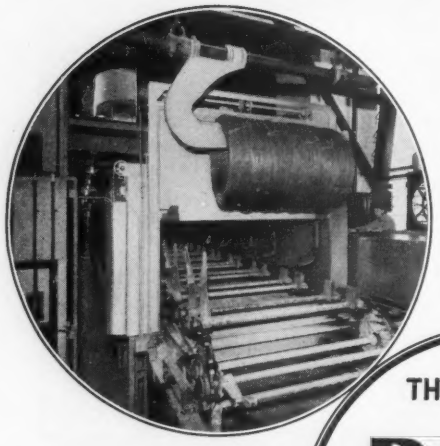

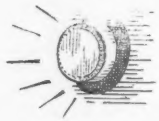

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Japanese Steel Firm Sets Up Separate Wire Company

KOBE Steel Works, Ltd., Japan's oldest and still foremost wire-drawing establishment, has voluntarily decided to reorganize into three separate companies although it narrowly escaped dismemberment under Allied anti-monopoly directives.

★ ★ ★

STEEL mill and wire drawing activities will be carried on under the old name, but non-ferrous metal smelting and machinery construction will be taken over by nominally separate companies.

★ ★ ★

RECOVERY in the Kobe rod and wire drawing mills has been rapid since the end of the war. Monthly production reached 5000 tons in 1948 and has been running at more than twice this rate since early 1949.

★ ★ ★

ESTABLISHMENT of a uniform exchange rate of 360 yen per U. S. dollar has been a disappointment to Japanese wire exporters. While the low rate makes imported raw materials (ore, pig iron, coal) relatively cheap to Japanese steel firms, the high cost of living and the resulting high money wages ("real" wages are below prewar levels) have a disastrous cumulative effect on the final cost of products that must pass through successive processing phases. This includes wire, nails, wire netting and wire rope.

★ ★ ★

BEFORE the war, Japan's economy thrived on the exportation of goods with a high labor and low raw material content, but today Japan is competitive, without subsidies, only in articles which have a high content of cheaply imported raw materials, or of wood and non-ferrous metals.

★ ★ ★

UNDER barter arrangements, and with little competition from Britain and the Continent, Japan has been able to sell small amounts of wire and wire products to dollar-starved countries in the Far East, including Australia.

★ ★ ★

Australian Imports of Wire Netting

BECAUSE of doubts about the availability of wire netting in Britain, the Commonwealth Government has granted licenses for importation of a total of 24,000 tons of netting from Germany, Belgium, France and the United States, in addition to a quantity from Japan at very high prices.

★ ★ ★

INFORMATION on total current availability from these sources is: Belgium, 4500 tons; France, 7000 tons; Germany, 10,000 tons; Japan, unknown; United States, almost any quantity in some gauges.

★ ★ ★

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AUSTRALIAN production is 11,000 tons a year, but immediate requirements to check an almost unprecedented rabbit plague are estimated at 40,000 tons. About 200,000 miles of rabbit-proof wire fencing is in need of replacement.

★ ★ ★

AUSTRALIA'S exports of wire rod in coils dropped from 81,031 cwt. in 1946-47 to 809 cwt. in 1947-48 (July 1 to June 30), but there was a slight recovery in the second half of 1948, with exports at 1,830 cwt. Australia's exports of wires in gauges below No. 15 I.S.W.G., including fencing wires Nos. 8 to 14, dropped from 2,009 cwt. in 1946-47 to almost nothing. On the other hand, shipments of steel nails heavier than No. 15 are well maintained at above 30,000 cwt. a year.

★ ★ ★

Scovill Making Slide Fastener

THE **Scovill Manufacturing Company** has announced it is now manufacturing and merchandising a new slide-fastener, a project, which was started in 1947 and which has already created 300 new jobs. Its potential employment, states vice president **Alan C. Curtiss** is many times this figure.

★ ★ ★

THE new device is being marketed under the name of "Gripper Zipper" and it is explained that the product incorporates structural designs borrowed from the automobile industry.

★ ★ ★

SCOVILL'S is ranked as one of the nation's leading producer of metal closures and the new undertaking will involve development of machine and product.

★ ★ ★

New Resin Cement for Tanks and Pipe Fittings Announced

THE **Electro Chemical Supply & Engineering Company,** who recently removed their offices from Paoli, Pa., to their new plant at 750 Broad Street, Emmaus, Pa., announces a new thermo-setting synthetic resin cement. LECITE. having novel physical and chemical properties. The material is inert to solvents, fats, oils, greases, alkalis and acids, except strong chromic, nitric, and sulphuric over 60°. Be at temperatures to 375°F. It is particularly useful for jointing acid-proof brick and pipe in the construction of neutralizers, disposal units, tanks, process equipment, towers, fume ducts and stacks, floors, etc., where the above corrosions are a factor. LECITE may be stored indefinitely at atmospheric temperatures, is non-toxic, will not foam to form a porous mortar and give off toxic fumes, sets quickly to form a dense, shiny, shock resistant joint. It is non-inflammable, and has a compression strength in excess of 10,000 pounds per square inch.

★ ★ ★

Speed Nuts Cut Costs

THE use of "Speed Nuts" in automotive assembly work has increased significantly in recent years altho few outside the industry appreciate the extent to which automotive producers have cut their costs by this means. Large savings in material handling expense are made possible by these unique fasteners. One car pro-

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ducer was able to save 48.2c per car through the use of 16 self-retaining fasteners to join the rear fenders to the body. Direct material savings were 5.6c; the balance or 42.6c resulted from reduced handling costs and overhead.

★ ★ ★

THE savings in materials handling, made possible by the use of self retaining fasteners, 54.7c per car, resulted from the use of special fasteners for eight applications on a car.

★ ★ ★

Carboloy Has New Responsibilities

ANNOUNCEMENT has been made by the **General Electric Company** that, effective January 1st, responsibility for all metallurgical manufacturing sales and engineering has been transferred to the **Carboloy Company, Inc.** This is a result of the expansion of the Carboloy Company's work in the metallurgical field and involves some new materials already created in the General Electric organization that make possible certain manufacturing operations that were impossible with the older conventional commercial materials.

★ ★ ★

Radioactive Alloy Wire

EXPERIMENTS are being conducted at the Ohio State Medical School with needles made from wire manufactured by the **Wilbur B. Driver Company,** Newark, N. J. These needles are baked in the atomic pile at Oak Ridge to make them radioactive and have been used successfully in the treatment of cancer by inserting them in the diseased tissue.

★ ★ ★

THE wire is a commercial alloy of 55% nickel and 45% cobalt, which latter on having been treated, radiates gamma rays. It has been found that in five years the needles will lose only half their potency.

★ ★ ★

BOTH the wire and the process of treating it are said to be low in cost.

★ ★ ★

Centrifugal Pump Installation and Operating Manual

A REVISED instruction booklet on the installation and operation of centrifugal pumps in corrosive service has been issued by **The Duriron Co., Inc.** While dealing specifically with Durcopumps, the information is applicable to all centrifugal pumps. The booklet deals with:

Proper location of pumps
Proper Foundations for pumps
Correct alignment
Priming standard pumps
Proper piping arrangements
Adjustment of impellers
Common troubles and how to overcome them.

★ ★ ★

FRICTION data, formulae for figuring capacity, head and horsepower, and conversion data.

★ ★ ★

COMPLETE information can be had by writing The Duriron Co., Inc., Dayton 1, Ohio, and asking for Bulletin 812A.

★ ★ ★

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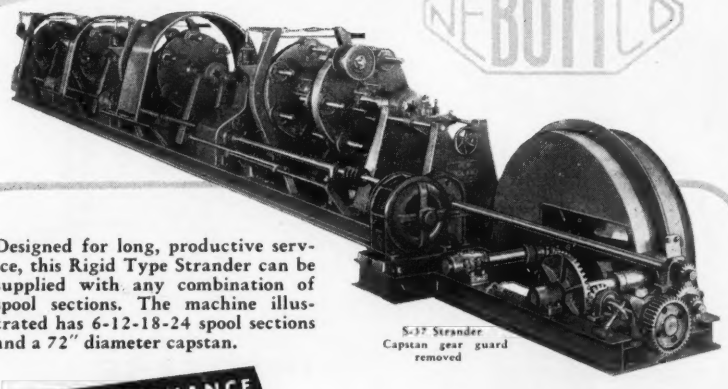

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The Waste Pickle Liquor Problem Part II

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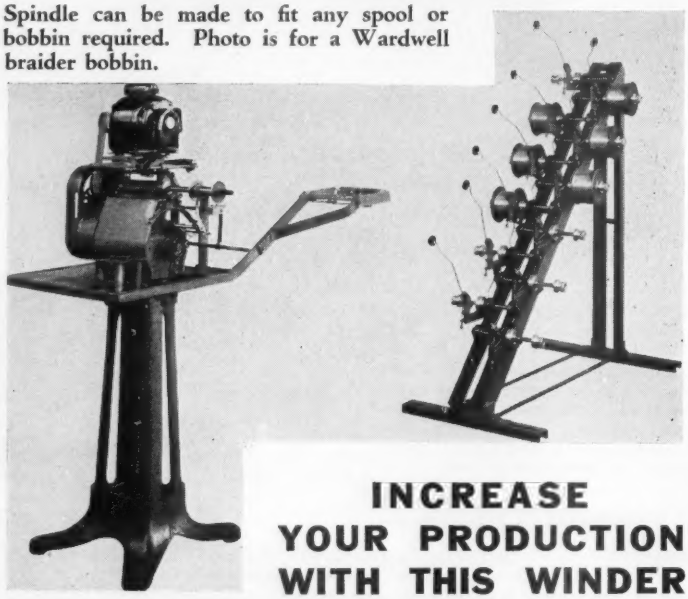

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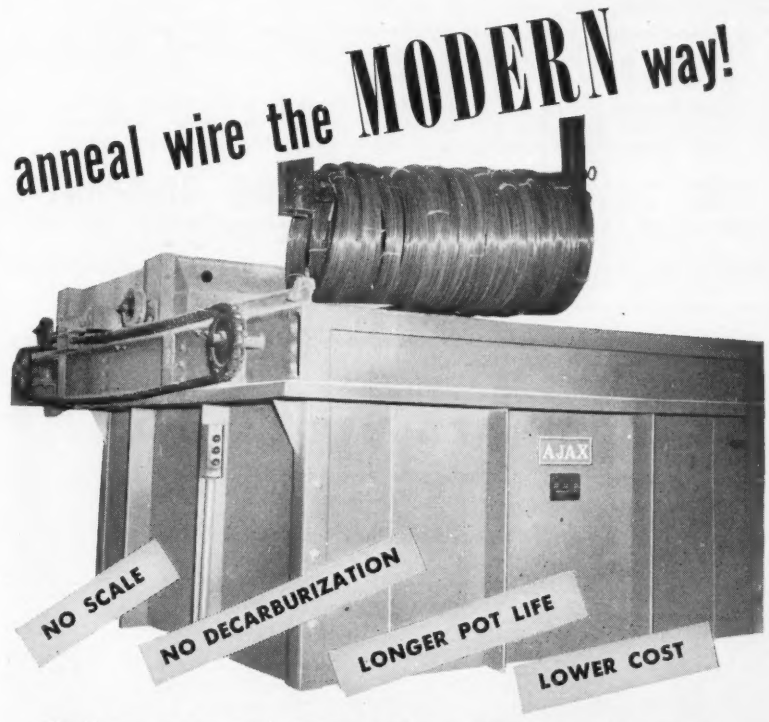

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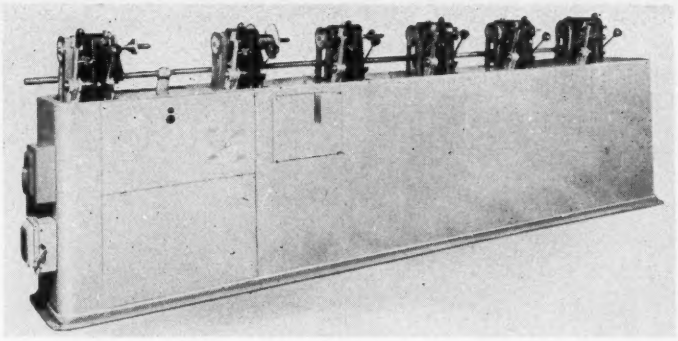

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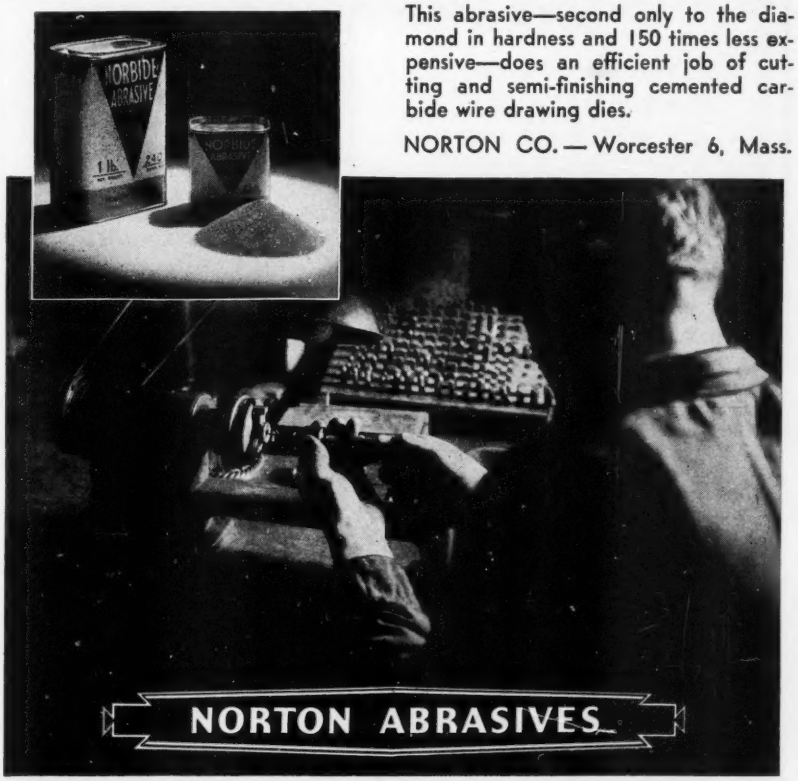

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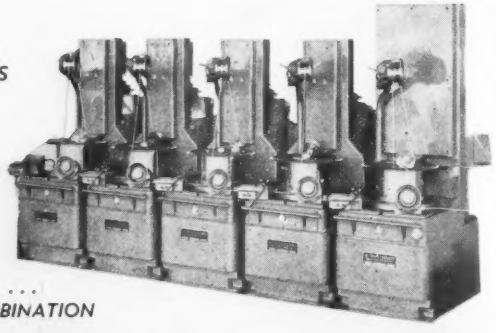

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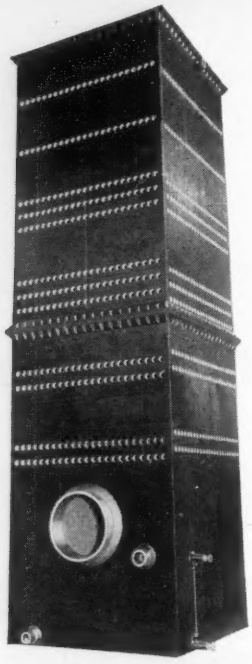

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THE reels have warp-proof plywood heads and one-piece hardwood Tekwood drums, held together by tightly drawn steel bands. Designed for a special group of wire ropes and strand, the reels tested matched the performance of bolted wood reels under loads up to 120 pounds during the testing period. Advantages include lower cost and a lighter, smoother reel. These qualities make them easy to handle and display and their smoothness makes it possible to use silk screen printing on their heads. Those used for the tests are a type supplied by the **Nelson Company** of Baltimore.

* * *

Improvements in Carbide Dies Listed in Carboloy Die Catalog Supplement

CARRYING details of improved features in its standard round hole dies, Supplement D-3 to its general die catalog D-126 has been issued by **Carboloy Company Inc.,** of Detroit. This supplement lists specifications and prices for dies R-1 through R-19 for drawing wire, bar and tubing.

* * *

AMONG improvements noted is the increased height of the carbide nibs in die numbers R-1 through R-6, giving materially longer die life. All rough cored dies now have "built-in" back relief. This feature is said to save time and labor when making new dies by eliminating cutting of back relief; to eliminate die failures due to incorrect back relief; and to save the diamond powder, etc., required for cutting back relief. In addition, some popular sizes of certain rough cored dies are now being made with a slightly smaller hole size which also reduces time required for finishing.

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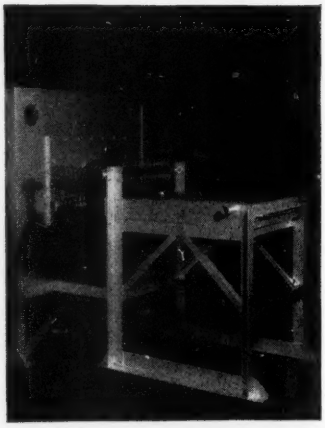

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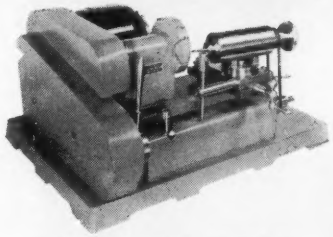

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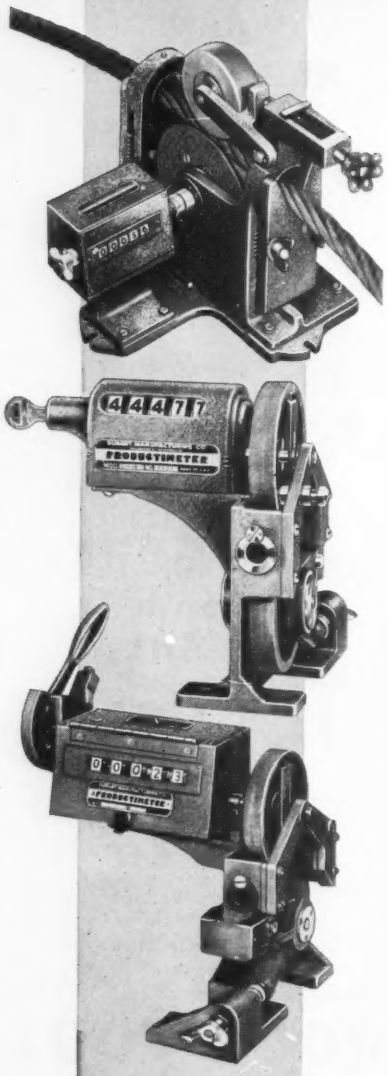

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THE book describes the principles involved in analysis, the use of apparatus, the methods of sampling a solution and the methods of analyzing for all of the important constituents in solutions for plating brass, cadmium, chromium, copper (cyanide and sulphate), gold (cyanide), black nickel, white nickel, H-VW-M bright cobalt-nickel, silver (cyanide), tin (alkaline), zinc (cyanide, Mazic and sulphate). An appendix covers the determination of Rochelle Salt in a cyanide copper plating solution.

* * *

THE book also includes descriptions of analytical equipment and solutions, and a number of very useful tables such as atomic weights, concentrations of acids, conversion factors, electrochemical data, electromotive series, galvanic series, metal salt solubilities in cyanides, percentage compositions of plating salts, reaction of acids and alkalies on metals, a table of conversion factors and a temperature conversion table.

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Story of the Twentieth Annual Convention of the Wire Association

(*Continued from page* 1132)

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"WELDING in the Wire Industry," the last paper of the day was presented ably and interestingly by **J. H. Corson,** Metallurgist for John A. Roebling's Sons Company. Mr. Corson outlined their own experiences that have, since the paper was prepared in July, been successfully concluded so that at long last they feel that they can make a dependable high carbon weld. As a result of their studies they have developed a welder in which all important operations are removed from the frailties of human judgment and embodied in a machine. At least, the human factors are minimized; these are expensive and variable in the best operators. Many examples of poor and good welds were portrayed with explanations as to what brought about each.

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THE afternoon was devoted to a "Symposium on Diamond Dies" prepared jointly by the members of the Diemakers Committee of the I.D.A. **Athos D. Leveridge** presided as Chairman and read the paper. The discussion panel consisted of **John W. Cowan,** Wayne Wire Die Company **Russell E. Connor,** Detroit Wire Die Company; **Fernand Durand,** Cochaud Wire Die Company; **Otis Ferrier,** Indiana Wire Die Company; **George Stewart,** Sylvania Electric Products Company; **William Wind,** Wilbur B. Driver Company; (Mr. Wind served as moderator); **Albert Richards,** Ajax Industrial Supplies; and **Amos D. Pumphrey,** Fort Wayne Wire Die Company. The paper, supported by data that represented cross-section opinions of the industry, was read by Mr. Leveridge. Pictures of what constituted good and bad die shapes, dissertations on lubricants and lubricating systems, diamond powders and die-room practices were presented, from which millmen

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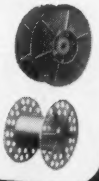

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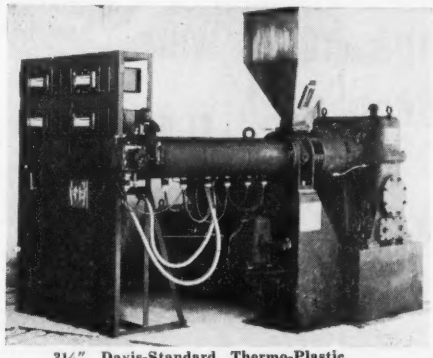

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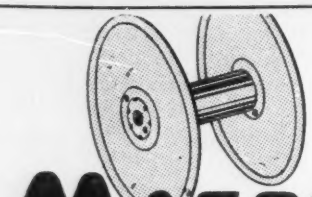
might compare their own experiences with those recommended. The panel was kept busy answering a flood of questions from the floor on such matters as how many times should a die be re-cut, the relative cost and life of diamonds against carbides, whether to mix carbides and diamonds in the same hook-up, die angles and so forth. The symposium may be considered a valuable contribution to the use of diamonds in the wire industry.

* * *

THE final day of the Convention opened in the morning under the chairmanship of **D. Boyd,** with a paper by **F. A. Rappelyea,** Chief Engineer for the Hubbard Spool Company, entitled, "Spools for Shipping Magnet Wire." The paper was an impartial appraisal of the various types of spool constructions, outlining the characteristics a spool should have to meet operating conditions and giving the favorable and unfavorable characteristics of each. The deflections and stresses to which spools are subjected in winding processes were gone into. Particular interest was shown in a new plastic-Fiberglas reinforced spool that has many desirable qualities, except for withstanding heat. They operate well, it was brought out, up to 300°F., lose their properties at 350°F., and will burn at 600°F. A modification of the present formula is being worked on that it is hoped will withstand temperatures up to 400°. Mr. Rappelyea deserves credit for having gathered together definite information on spools that has been much needed by wire men.

* * *

F. A. ARNOLD, Metallurgist for the General Electric Company, gave a paper on the "New General Electric Company Copper Mill." This copiously illustrated lecture aroused considerable interest. He pointed out that wire manufacture is almost entirely a material handling proposition and that keeping costs down is closely related to efficient flow and handling of work. Fort Wayne, he said, was a natural location for this mill because their fractional horse-power motor, transformer and other divisions



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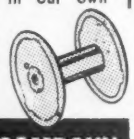

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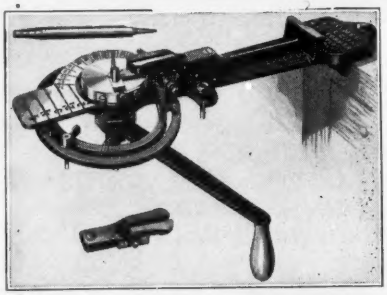

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MANY questions arose as to procedures there, one of special interest relating to shaving. Rods are shaved, Mr. Arnold said, only when requested by customers, except on fine wire, rods destined for which use must be shaved to avoid excessive breakage. He felt that shaving did not materially add to die life. The paper was so well handled that it was almost as good as a visit to the plant itself.

* * *

FOR the last lap, in the afternoon, **Dr. Bruce Gonser** of the Battelle Memorial Institute served as Chairman. He introduced **Orville E. Cullen,** Chief Metallurgist, who with **E. G. de Coriolis,** Director of Research, both from the Surface Combustion Corporation had compiled the paper, "Protective Atmospheres for Annealing Non-ferrous Wires." The paper was read by Mr. Cullen. It set forth the different types of atmospheres that can be used, described equipment for producing them, cited instances where atmospheres are not essential. He stressed the necessity for eliminating all traces from sulphur, as from discussion, it developed that sulphur may be introduced into the annealing chamber if wire drawing compounds are not completely removed from the wire prior to annealing. It was brought out that little good would result from atmosphere-annealing aluminum or aluminum alloys due to aluminum's characteristic of oxidizing almost instantly in the air. Brass is most difficult to bright anneal and it is believed that it is better to use conventional methods and then pickle. Mr. deCoriolis answered many of the floor questions, covering the ground with authority and clarity.

* * *

"NEW Development in the Tinning of Wire" was the title of a paper by **Herbert Hirschland** of the Research Department of the Metal & Thermit Corporation and **Dr. Frederick A. Lowenheim,** Di-

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rector of this same Department of the company. Dr. Lowenheim read the paper. It was a timely and fine presentation of the several methods available for tinning steel and copper wire. Steel is most commonly coated in places where the wire may have contact with foods, as in refrigerators, and copper is coated to prevent contact of rubber coatings with the wire. A little history took the process back a century, at which time an aqueous immersion process was developed that served well for the handicraft processes of the times, but which modern mass-production methods have outmoded. Different modern processes were described and compared, the difficulties and good points of each presented in tabular form, from which it might be gathered that the several acid methods were not critical and are easy to use and the alkaline methods generally are hard to control, but have the ability to turn out a higher quality of work. In the discussion from the floor it developed that no satisfactory method has been developed for plating stainless with tin, that hot dipping may be simple, but produces a poorer quality of plating than electrolytic processes, that aluminum alloys can be plated, although pure aluminum cannot and that tinning copper offers no serious obstacle to assembly work, as in soldering connections. The paper is one that may be studied to advantage by all having to do with tinning.

★ ★ ★

C. A. (CY.) LITZLER concluded the technical sessions with a brilliantly presented paper on "Nylon Insulation." He pointed out the importance of the subject with the fast-growing use of nylon to replace polyethylene and other coatings. His paper described and illustrated the processes and equipment required to do a good job and the changes in equipment required to secure top-notch results as against polyethylene coatings. Nylon, it appears, is a more critical material, but handled properly, gives some advantages in many ap-

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plications. One of its good points is its high dielectric strength, about three times that of other commercial products, and its ease of removal in assembly work.

* * *

COMMENT from the floor elicited the information that at least one wire rope manufacturer is doing a good business in nylon coated steel cables. However, some difficulties had been encountered to which Mr. Litzler gave the probable answers. Electric wire manufacturers will find in the paper a veritable handbook of practical information, that should be of value for some time to come.

* * *

AMONG the interesting sidelights of the Convention was a diamond exhibit set up in a room off the registration desk by the Industrial Diamond Association in which diamond applications to industry were portrayed. The exhibit was open from Tuesday evening thru Thursday.

* * *

AS in previous years, the Convention assumed an international atmosphere due to the presence of members from various European countries. England, as usual, was well-represented and the delegation from Canada, which can hardly be considered a foreign country, was gratifyingly representative of the wire industry there.

* * *

WHILE our own observations on the success of the Twentieth Annual Convention were favorable, the opinions generally expressed by members who attended are what really count; the consensus was that it was a great affair—technical sessions were meaty and well attended, the Annual Luncheon left nothing to be desired and the Stag-Smoker was tops.

* * *

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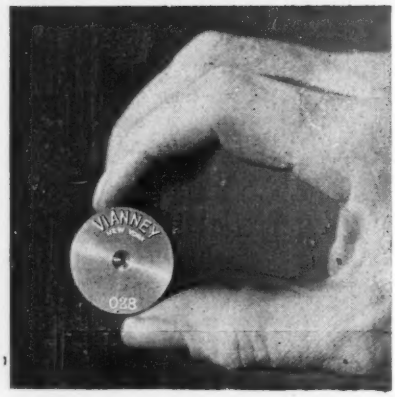

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issue of WIRE AND WIRE PRODUCTS, which together with the papers published in October, November and December, as well as the Mordica Memorial Lecture in January, give our readers the complete story.

★ ★ ★

TOO much cannot be said for the fine cooperation and teamwork of **Fred Crapo**, Chairman of the Program Committee, **A. E. Glen** and **L. C. Whitney**, Ferrous and Non-Ferrous Committee Chairmen, and their committee members. They performed an outstanding service to the members of the Wire Association for which the praise and thanks of all are due.

★ ★ ★

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The Measurement and Control of Eccentricity in Insulated Cables

(*Continued from page* 1115)

cable current, and of deriving an indication of the sign of the eccentricity signal.

★ ★ ★

DEALING first of all with the cable current, it is apparent that in a direct reading instrument it will be necessary either to maintain this current constant, or to have a knowledge of its amplitude at every measuring instant. In the present equipment the first alternative has been chosen. A resistance-capacitance tuned oscillator, followed by a push-pull pentode output stage, using a specially designed transformer of very high shunt impedance, provides a current source of an impedance which is large compared with that of the cable itself, when the latter is completely wound up on a normal metal drum. The current passing through the cable is therefore, substantially constant. Stabilization of the power supply further ensures independence from mains fluctuations. The cable current normally used is 100mA. A.C., as before, and it is of sub-audible frequency, so as to prevent the terminal voltage applied to the cable from rising to an unsafe value in the case of long cables of small diameters, the 'wound up' inductance of which may be appreciable.

★ ★ ★

THE gauge head comprises as before two pairs of pick-up coils mounted at right angles to each other. Fig. 10 shows the block circuit of the control unit and wiring of the gauge head. As shown the X coils are connected electrically opposing, and their output voltage is fed via the input selector switch to the detector amplifier. A filter is included to guard against errors due to mains hum and other extraneous noise.

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be shown that the E.M.F. generated in a pair of coils connected electrically aiding is substantially independent of the position of the conductor, or its eccentricity, over the measuring range. A constant signal may, therefore, be obtained in this way which after amplification is used as the "carrier" to demodulate the eccentricity signal in a rising modulator. The D.C. output from the latter is arranged to operate a centre zero indicating meter, as well as a polarized relay. The latter may be used to control the position of the die automatically by means of servo motors, so as to maintain concentricity of the cable to specified limits. Alternatively, an alarm system may be operated by means of the relay to indicate when the eccentricity has exceeded the permissible tolerance.

★ ★ ★

A SIMPLE calibrating device has been provided with this equipment which serves as an overall check on the oscillator output cable current and detector amplifier gain. Upon the operation of a push button the electrically opposing pairs of coils are disconnected from the amplifier and a pre-determined fraction of the signal derived from the coils connected electrically aiding is injected into the selective amplifier. The indication of the meter will therefore, record a pre-determined value of eccentricity, denoted by a special calibration mark. Any deviation from this reading is corrected by the adjustment of the amplifier gain.

★ ★ ★

IN cases where it is required to control a number of extruding machines automatically with the same equipment, a motor-driven commutator switch is interposed between the various gauge heads and the input terminals of the control unit. This switch is arranged to connect the X and Y windings of each gauge head in turn to the control unit. At the same time, the oscillator output is switched to the corresponding cable, and the relay contacts are similarly connected

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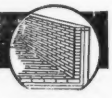

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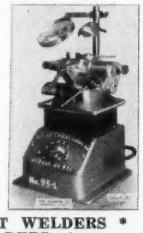

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Acknowledgments:

The writers are greatly indebted to Ian I. Boswell, and C. A. Flamand of Les Tréfileries & Laminoirs du Havre, for many helpful suggestions, and gratefully acknowledge the assistance given by D. P. C. Thackeray and A. Bedford.

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New Bulletin on Spring Tester

A NEW 4-page illustrated bulletin, No. 302, has been prepared to describe and illustrate the Baldwin-Hunter spring tester and its applications. This instrument, newly available from Baldwin Locomotive Works, is applicable to any type of small springs for loads up to 5 pounds and length up to 12 inches at specified load. The bulletin explains the value of this precision instrument, shows its design features, set-up and operation for production testing, and illustrates its use in various ways. Specifications are also given. Copies are available from **The Baldwin Locomotive Works, Testing Equipment Department,** Philadelphia 42, Pa.

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Data Sheet on Proper Care of Silicone Varnish

BECAUSE of the increasing use of DC996 Silicone Varnish the **Dow, Corning Corporation,** Midland, Mich., has prepared a technical data sheet outlining the best methods of handling this material or any electrical insulating varnish.

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ELECTRICAL engineers and production men will find in this bulletin information that will be helpful in maintaining production schedules and in getting the greatest value out of insulating materials through proper care and use, with sections on cleanliness, proper viscosity, how to measure viscosity and as solvents and thinners.

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COPIES of this will be sent by the company to those interested in having one.

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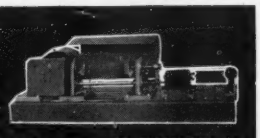

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For more complete information, consult the annual Wire and Wire Products Directory, Index & Buyer's Guide.

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Norton Co., Worcester, Mass.

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(See Inhibitors, Pickling)

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Atlas Mineral Products Co., Mertztown, Pa.
Haveg Corporation, Newark, Del.
Sauereisen Cements Co., Pittsburgh, Pa.

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Syncro Machine Co., Perth Amboy, N J.

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Scudder, E. J., Foundry & Machine Co., Trenton, N. J.

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New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machy., Inc., Pawtucket, R. I.

BAKERS—Rod and Wire
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Morgan Construction Co., Worcester, Mass.
Ross, J. O., Engr. Corp., New York, N. Y.

BAR STOCK—Stainless Steel
Armco Steel Corp., The, Middletown, Ohio.
American Steel & Wire Company, Cleveland, Chicago, New York.
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Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

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Pacific Coast Borax Corp., New York, N. Y.

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Norton Co., Worcester, Mass.

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Entwistle, Jas. L. Co., Pawtucket, R. I.

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Industrial Ovens, Inc., Cleveland, O.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

CASTINGS—Wire Mill
Scudder, E. J., Fdry. & Mach. Co., Trenton, N.J.

CEMENTS—Acid Proof
Atlas Mineral Products Co., Mertztown, Pa.
Sauereisen Cements Co., Pittsburgh, Pa.

CEMENTS—Refractory
Norton Co., Worcester, Mass.
Sauereisen Cements Co., Pittsburgh, Pa.

CHEMICALS—Cleaning
(See Cleaners—Metal)

CLEANERS—Metal
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.
Metal & Thermit Corp., New York, N. Y.
Oakite Products, Inc., New York, N. Y.
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Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
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Wickwire Bros., Cortland, N. Y.
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COATING COMPOUNDS—
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Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

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American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Diamond
Eastern Carbide Corp., New Rochelle, N. Y.
Hyprez Division, Engis Equipment Co., Chicago, Ill.
Magnus Chemical Co., Garwood, N. J.

COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Metal & Thermit Corp., New York, N. Y.

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American Chemical Paint Co., Ambler, Pa.
American Lanolin Corp., Lawrence, Mass.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

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Magnuson Products Corporation, Brooklyn, N. Y.
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Swift & Company, Chicago, Ill.

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Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
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Vaughn Machinery Co., Cuyahoga Falls, O.

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Metal Carbides Corporation, Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, New York.
Vascoloy-Ramet Corp., North Chicago, Ill.
Willey's Carbide Tool Co., Detroit, Mich.

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Champion Diamond Co., New York, N. Y.
Diamond Distributors, Inc., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

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Hyprez Division, Engis Equipment Co., Chicago, Ill.
Indiana Wire Die Co., Ft. Wayne, Ind.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
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Metal Carbides Corporation, Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Carbide
(See Dies—Tungsten Carbide)

DIES—Cold Heading
Adamas, Carbide Corporation, Harrison, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio.
Vascoloy-Ramet Corp., No. Chicago, Ill.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Champion Diamond Co., New York, N. Y.
Cochaud Wire Die Corp., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Extrusion
Adamas, Carbide Corporation, Harrison, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Metal Carbides Corporation, Youngstown, Ohio.
Robertson, John, Co., Brooklyn, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Eyelet
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
Adamas, Carbide Corporation, Harrison, N. J.
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Detroit, Mich.
Champion Diamond Co., New York, N. Y.
Cochaud Wire Die Corp., New York, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Special Shapes, Etc.
Adamas, Carbide Corporation, Harrison, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp. McKeesport, Pa.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

DIES—Tantalum Carbide
Adamas, Carbide Corporation, Harrison, N. J.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp. McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, Ohio.

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Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.

DIES—Tube Drawing
Adamas, Carbide Corporation, Harrison, N. J.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Tungsten Carbide
Adamas, Carbide Corporation, Harrison, N. J.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRUMS—Flange Steel
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., The, Paterson, N. J.

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Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Industrial Ovens, Inc., Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N. Y.

ENGINEERS—Consulting Hot Galvanizing
Wallace G. Imhoff Co., The, Los Angeles, Calif.

ENGINEERS—Consulting Spring Design
Carlson, Co., The, New York, N.Y.

ENGINEERS—Consulting Wire Mill
Fisher, Edward J. P., North Jackson, Ohio.
Lewis, Kenneth B., Worcester, Mass.
Wickwire, T. H. Jr., Philadelphia, Pa.

EQUIPMENT—Insulation Testing
Davis, R. L., Elec. Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FENCING & FENCES—Wire
Interlocking Fence Co., Morton, Ill.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M. Co., Pittsburgh, Pa.

FRICTION PAY-OFF STANDS—
Industrial Ovens, Inc., Cleveland, Ohio.

FURNACES—Annealing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Electric
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Hard'ing & Temp'ing
Ajax Electric Co. Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., The, Cleveland, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio.
Robertson, John, Co., Brooklyn, N. Y.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Oxidizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Normalizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Pot (Oil, Gas, Electric)
Ajax Electric Co., Inc., Philadelphia, Pa.

FURNACES—Resistance Heating, Strand
Trauwood Engineering Co., Cleveland, Ohio.

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corporation, Toledo, O.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
General Electric Co., Schenectady, N. Y.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Surface Combustion Corporation, Toledo, O.
Trauwood Engineering Co., The, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

GALVANIZING EQUIPMENT—
Steel Equipment Co., Cleveland, Ohio.
Wean Equipment Corp., Cleveland, Ohio.

GALVANIZING KETTLES—
National Annealing Box Co., Washington, Penna.

GRINDERS—Roll
Norton Co., The, Worcester, Mass.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio.

HOOKS—Pickling and Liming
Youngstown Welding & Engineering Co., Youngstown, Ohio.

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

INSULATING LACQUERING SYSTEMS—Continuous
American Insulating Machine Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.

INSULATING MATERIALS—
Belding, Heminway, Corticelli Co., New York, N. Y.
Du Pont de Nemours, E. I., Co., Wilmington, Del.
Martin, Glenn L., Company, Baltimore, Md.
Owens Corning Fiberglas Corp., Toledo, O.
Twitchell, E. W., Philadelphia, Pa.

INSULATING MATERIALS—Paper—For Electric Wire Cable.
Twitchell, E. W., Philadelphia, Pa.

LATHES—Die Reaming
Carboloy Co., Inc., Detroit, Mich.
Roos, Tool & Mfg. Co., Montclair, N. J.

LIME—
Warner Co., Philadelphia and Bellefonte, Pa.

LININGS—Acid and Alkali Proof
Haveg Corp., Newark, Del.
Sauereisen Cements Co., Pittsburgh, Pa.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Swift & Co., Chicago, Ill.

LUMBER—Wire Mill, for lagging and car blocking.
North Anson Reel Co., North Anson, Maine

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Barbed Wire
Glader Machine Works, Chicago, Ill.
Wean Engineering Co., Cleveland, Ohio.

MACHINERY—Bead Wrapping
Terkelsen Machine Co., Boston, Mass.

MACHINERY—Braiding
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Brazing
Eisler Engineering Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Bunching
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Nilson, A. H. Machine Co., The, Bridgeport, Conn.

MACHINERY—Cable, Rope Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coilers
Boyd & Sons Manufacturing Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (used), New York, N. Y.
New England Butt Co., Providence, R. I.
Ruesch, H. J. Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

WHERE TO BUY, Continued

Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

MACHINERY—Cold Heading
(See Cold Headers)

MACHINERY—Copper Wire Drawing and Rolling
Aetna-Standard Engineering Co., Youngstown, Ohio.
American Insulating Mach'y Co., Phila., Pa.
National Machinery Exchange (used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
American Insulating Mach'y Co., Phila., Pa.
National Erie Corp., Erie, Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Standard Machinery Co., Mystic, Conn.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio.
Mettler Machine Tool, Inc., New Haven, Conn.
National Mach'y Exch. (Used) New York, N. Y.
Nilson Machine Co., A. H., Bridgeport, Conn.
Porter, H. K., Inc., Everett, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Die Making
Carboloy Co., Inc., Detroit, Mich.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Roos, Tool & Mfg. Co., Montclair, N. J.
Wayne Wire Die Co., Hillside, N. J.
Wickman, A. C., Ltd. Coventry, England.

MACHINERY—Draw Benches
Aetna-Standard Engineering Co., Youngstown, Ohio.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Edging
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Extruding
National Erie Co., Erie, Pa.
Robertson, John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.
Standard Machinery Co., Mystic, Conn.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Fence
Blashill, Arthur, Woodstock, Ont., Canada.
Glader, Wm., Machine Works, Chicago, Ill.
Interlocking Fence Co., Morton, Ill.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Galvanizing
(See Galvanizing Equipment)

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Pawtucket, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
National Erie Co., Erie, Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lead Encasing Presses, etc.
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving
Interlocking Fence Co., Morton, Ill.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Material Handling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MACHINERY—Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, Jas. L. Co., Pawtucket, R.I.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I

MACHINERY—Pickling
Chemsteel Construction Co., Pittsburgh, Pa.
Youngstown Welding & Engineering Company, Youngstown, Ohio.

MACHINERY—Pointing
Aetna-Standard Engineering Co., Youngstown, Ohio.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Poultry Wire Fencing
Interlocking Fence Co., Morton, Ill.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rubber Insulating
Royle, John & Sons, Paterson, N. J.
Standard Machinery Co., Mystic, Conn.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Mystic, Conn.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Screw Wire
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila, Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Ruesch, H. J. Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Mystic, Conn.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Boyd & Sons Manufacturing Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
National Mach'y Exch. (Used), New York, N.Y
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O. Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Spring Making
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Lewis Machine Co., The, Cleveland, Ohio.
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N.Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Stranding
Hughesville Machine & Tool Co., Hughesville, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Forming
Wickman, A. C., Ltd., Coventry, England.

MACHINERY—Strip Steel
Aetna-Standard Engineering Co., Youngstown, Ohio.
Ruesch, H. J., Machine Co., Newark, N. J.
Steel Equipment Co., Cleveland, Ohio.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Swaging
National Erie Corp., Erie, Pa.
National Mach'y Exch. (Used), New York, N.Y
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Foundry & Machine Co. Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Testing Physical
Eberbach & Son Co., Ann Arbor, Mich.
Scott Testers, Inc., Providence, R. I.

MACHINERY—Testing Equipment—Sparkers
Davis, R. L. Elec. Co., Wallingford, Conn.
Entwistle, Jas. L., Pawtucket, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Wean Equipment Co., Cleveland, Ohio.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

WHERE TO BUY, Continued

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Welding Wire
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Eisler Engineering Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply, Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wind-up (Constant Tension, Variable Speed)
Aetna-Standard Engineering Co., Youngstown, Ohio.
Davis, R. L. Electric Co., Wallingford, Conn.
General Electric Co., Schenectady, N. Y.
Industrial Ovens, Inc., Cleveland, Ohio.
Standard Machinery Co., Mystic, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.
Kilmer, M. D., & Co., Cleveland, Ohio.

MACHINERY—Wire Drawing
Aetna-Standard Engineering Co., Youngstown, Ohio.
American Insulating Mach'y Co., Phila., Pa.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co. Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Wire Forming
Kilmer, M. D. & Co., Cleveland, Ohio.
National Mach'y Exch. (Used), New York, N.Y.
Nilson Machine Co., A. H., Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Wickman, A. C., Ltd., Coventry, England.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wood Screw
National Mach'y Exch. (Used), New York, N.Y.

MACHINERY—Wrapping Straight Lengths and Tubing
Angier Corporation, The, Framingham, Mass.
Terkelsen Machine Co., Boston, Mass.

MACHINERY—Wrapping Wire Coils
Angier Corporation, The, Framingham, Mass.
Terkelsen Machine Co., Boston, Mass.

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem, Rolling & Edging
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Co., Cleveland, Ohio.

NAILS—Wire
American Steel & Wire Co., Cleveland, Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling, John A. Sons Co., Trenton, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.
U. S. Steel Export Co., New York, N. Y.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila., Pa.
General Electric Co., Schenectady, N. Y.
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Dehydrogenizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Industrial
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Industrial Ovens, Inc., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Industrial Ovens, Inc., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Pa.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Angier Corporation, The, Framingham, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—For Coil Wrapping and Corrosion Prevention
Angier Corporation, The, Framingham, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.
Terkelsen Machine Co., Boston, Mass.

PATENT ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D.C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

PICKLING—Hooks, etc. Acid Resisting
Youngstown Welding & Engineering Company, Youngstown, Ohio.

PICKLING TANK LININGS—
Atlas Mineral Products Co., Mertztown, Pa.
Haveg Corp., Newark, Del.
Sauereisen Cements Co., Pittsburgh, Pa.

PIPES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

PLASTIC TESTERS—
Scott Testers, Inc., Providence, R. I.

PNEUMATIC CYLINDERS
Entwistle, James L. Co., Pawtucket, R. I.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio.

POTS—Lead Melting
National Annealing Box Co., Washington, Pa.
Robertson, John, Co., Brooklyn, N. Y.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.
Standard Machinery Co., Mystic, Conn.

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Pa.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry & Mach. Co., Trenton, N.J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

REEL AND TENSION STANDS—
Davis, R. L. Electric Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, Ohio.
Roll-a-Reel, Cincinnati, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Roll-a-Reel, Cincinnati, Ohio.
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Drawn Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Co., Chicago, Ill.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Company, Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS & SPOOLS—Collapsible
Entwistle, Jas. L. Co., Pawtucket, R. I.

REELS & SPOOLS—Plastic
Hubbard Spool Company, Chicago, Ill.

REELS & SPOOLS—Steel
American Pulley Company, Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mason Can Company, Providence, R. I.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS AND SPOOLS—Shipping and Shop
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Company, Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg., Co., The, Hazardville, Conn.
Clark, J. L., Mfg., Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mason Can Company, Providence, R. I.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.
North Anson Reel Co., North Anson, Maine.

REELS & SPOOLS—Wooden
Acrometal Products, Inc., Minneapolis, Minn.
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
North Anson Reel Co, North Anson, Maine.

REELS—Metal Bound
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
North Anson Reel Co., North Anson, Maine.

REELS—Takeoff
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Company, Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg., Co., The, Hazardville, Conn.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.
North Anson Reel Co., North Anson, Maine.

REELS—Vulcanizing & Impregnating
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wire Drawing
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Company, Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Company, Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg., Co., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mason Can Company, Providence, R. I.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.
North Anson Reel Co., North Anson, Maine.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

RESISTANCE HEATING—Annealing Patenting, Etc.
Trauwood Engr. Co., Cleveland, Ohio.

WHERE TO BUY, Continued

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Ross, J. O., Engineering Corp., New York, N. Y.

RODS—Nickel Alloy
Eastwood Nealley Corp. Belleville, N. J.
International Nickel Co., Inc., New York, N.Y.

RODS—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio.
Armco Steel Corp., The, Middletown, Ohio.

RODS—Wire—Non-Ferrous
Eastwood Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Wire
American Steel & Wire Company, Cleveland, Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Roebling's John A., Sons Co., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire-Spencer Steel, Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott Testers, Inc., Providence, R. I.

RUST PROOF COMPOUNDS—
(See Compounds—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See Compounds—Rust Preventing)

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y Inc., Pawtucket, R. I.

SOAPS—Industrial and Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Inc., Chicago, Ill.
Swift & Company, Chicago, Ill.

SOLVENT RESIN SYSTEMS—Experimental
Industrial Ovens, Inc., Cleveland, Ohio.

STAMPINGS—Steel
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Armco Steel Corp., The, Middletown, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Roebling's, John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., Paterson, N. J.

TANKS—Compound
Atlas Mineral Products Co. of Pa., Mertztown, Pa.
Haveg Corp., Newark, Del.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Haveg Corp., Newark, Del.
Sauereisen Cements Co., Pittsburgh, Pa.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.
National Annealing Box Co., Washington, Pa.

TINSEL—Cords, Decorative
(See: Tinsel—Electric Conductor)

TINSEL—Electric Conductor
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.

TINSEL—Electric Resistance
(See: Tinsel—Electric Conductor)

TINSEL—Lame, Silver and False Gold
(See: Tinsel—Electric Conductor)

TINSEL—Thread, Silver and False Gold
(See: Tinsel—Electric Conductor)

TINSEL—Thread, Decorative
(See: Tinsel—Electric Conductor)

TOOLS—Wire Cutting
Porter, H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRAVERSES—For Reels
Entwistle, James L. Co., Pawtucket, R. I.
Hubbard Spool Company, Chicago, Ill.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

TUBE BENDERS AND FORMERS—
H. D. Kilmer Co., Cleveland, Ohio.
Ruesch, H. J., Machine Co., Newark, N. J.

VALVES AND FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago Ill.

WIND-UP AND UNWIND SYSTEMS—Continuous
American Insulating Mach'y Co., Phila., Pa.
Davis R. L. Electric Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

WIRE—Aluminum
Aluminum Co. of America, Pittsburgh, Pa.
Malin & Co., Cleveland, Ohio.

WIRE—Barbed
Interlocking Fence Co., Morton, Ill.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Co., Cleveland-Chicago, New York.
Armco Steel Corp., The, Middletown, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Enameled for Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
American Steel & Wire Co., Cleveland-Chicago, New York.
Armco Steel Corp., The, Middletown, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div. of Colorado Fuel & Iron Corp., Buffalo, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
American Steel & Wire Co., Cleveland-Chicago, New York
Columbia Steel Co., San Francisco, Calif.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., Cleveland, Ohio.
U. S. Steel Export Co., New York, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.

WIRE—Nickel & Nickel Alloy
Eastwood-Nealley Corp., Belleville, N. J.
International Nickel Co., Inc., New York, N.Y.

WIRE—Nickel Silver and Phosphor Bronze
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Non-Ferrous to Specification for Special Purposes
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.

WIRE—Spring
American Steel & Wire Co., Cleveland-Chicago, New York.
Armco Steel Corp., The, Middletown, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Indiana.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
U.S. Steel Export Co., New York, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Co., Cleveland-Chicago, New York
Armco Steel Corp., The, Middletown, Ohio.
Columbia Steel Co., San Francisco, Calif.
Firth Sterling Steel & Carbide Co., McKeesport, Pa.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Straightening and Cutting—
Pittsburgh Cut Wire Co., Pittsburgh, Pa.
Wickwire Brothers, Inc., Cortland, N. Y.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE CLOTH—Industrial
Roebling's John A., Sons Co., Trenton, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.

WIRE TESTERS—
Scott Testers, Inc., Providence, R. I.

WIRE, WEAVING—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

WRAPPING PAPER—Creped
Angier Corporation, The, Framingham, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.

YARNS & TAPES—
Belding, Heminway, Corticelli Co., New York, N. Y.
Du Pont de Nemours, E. I., Co., Wilmington, Delaware
Owens Corning Fiberglas Corp., Toledo, Ohio.
Twitchell, E. W., Philadelphia, Pa.

YARN TESTERS—
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AUTHORS

Contributing the Leading Articles to WIRE AND WIRE PRODUCTS During the Year, 1949

ARNOLD, F. A., Division Engineer
Wire & Insulation Division
General Electric Company
Fort Wayne, Indiana

BACON, RALPH W., Secretary
Insect Wire Screening Bureau
New York, New York

BARTLETT, GUY
General Electric Company
Schenectady, New York

BASTIAN, E. L. H., Staff Engineer
Lubricants Department
Shell Oil Company
New York, New York

BROWN, REGINALD S., Chief Metallurgist
Rylands Brothers, Ltd.
Warrington, England

BULLOCK, FRANK W., Col. (U.S.A.Rtd.)
Island Creek, Maryland

BUNDY, O. M., Asst. Chief Engineer
The Clark Controller Company
Cleveland, Ohio

CALDWELL, H. A., Chief Metallurgist
Tennessee Coal, Iron & Railroad Company
U. S. Steel Corporation Subsidiary
Birmingham, Alabama

CHUBB, W., Jr., Research Fellow
Missouri School of Mines & Metallurgy
Rolla, Missouri

COLLIS, H. O., Electrical Engineer
Owens Corning Fiberglas Corporation
Toledo, Ohio

CORSON, JOHN H., Chief Metallurgist
Development Engineering
John A. Roebling's Sons Company
Trenton, New Jersey

CULLEN, O. E., Chief Metallurgist
Surface Combustion Company
Toledo, Ohio

DARDEL YVES
Paris, France

DAVIDSON, N., Technical Director
Sir James Farmer Norton & Company, Ltd.
and Director and General Manager
Wire Drawing Dies (Manchester), Ltd.
England

DAVIS, G. B., Sales Manager
Baker Industrial Truck Division
Baker-Raulang Company
Cleveland, Ohio

deCORIOLIS, E. G., Director of Research
Surface Combustion Company
Toledo, Ohio

DeLONG, F. B., Vice-President & General Manager Sales
Columbia Steel Company
San Francisco, California

DOTY, DAVID L.,
Metallurgical Department
Jones & Laughlin Steel Company
Aliquippa, Pennsylvania

EPPELSHEIMER, D. S., Director of Research and Professor of Metallurgical Engineering
Missouri School of Mines & Metallurgy
Rolla, Missouri

GALLOWAY, J. W., Plant Engineer
B. Greening Wire Company, Ltd.
Hamilton, Ont., Canada

GODFREY, H. J., Asst. Chief Engineer
Development Engineering
John A. Roebling's Sons Company
Trenton, New Jersey

GORAL, E. W., Materials Engineering Dept.
Stromberg Carlson Company
Rochester, New York

GORE, TOM
San Francisco, California

HAYDEN, F. L., Works Manager
Steel Company of Canada, Ltd.
Hamilton, Ont., Canada

HILL, R.,
British Iron & Steel Research Association
Cambridge, England

HIRSCHLAND, HERBERT, E.
Metal & Thermit Corporation
New York, New York

HUTCHINSON, J., Development Engineer
Sciaky Electric Welding Machines, Ltd.
England

IMHOFF, WALLACE G., President
Wallace G. Imhoff Company
Los Angeles, California

JACOBSEN, HAROLD F., Director of Packaging & Loading
American Steel & Wire Company
U. S. Steel Corporation Subsidiary
Cleveland, Ohio

KENYON, JOHN N., Dr.
Consulting Research Engineer
Princeton, New Jersey

LEES, D. C. G., Metallurgist
Aluminum Development Association
England

LEWIS, DARTREY, Chief Engineer
Development Engineering
John A. Roebling's Sons Company
Trenton, New Jersey

LEWIS, KENNETH B.,
Consulting Wire Mill Engineer
Worcester, Mass.

LITZLER, C. A., Chief Engineer
Industrial Ovens, Inc.
Cleveland, Ohio

LLOYD, H. R., Machinery Director
Industrial Engineering Divisions
General Electric Company
Schenectady, New York

LOWENHEIM, FREDERICK A.,
Metal & Thermit Corporation
New York, New York

McGOWAN, C. I., Superintendent
Wire Mills
Atlantic Steel Company
Atlanta, Georgia

MORRAL, F. R., Professor
Department of Materials Engineering
Syracuse University
Syracuse, New York

ORR, CHARLES P., President
Standard Industrial Compounds Company
Chicago, Illinois

PERRY, A. L. H., Technical Assistant
The Shell Petroleum Company, Ltd.
England

PLANER, F. E., Dr.
Addison Electric Company, Ltd.
London, England

PLANER, V., Dr.
London, England

RAPPLEYEA, F. A., Chief Engineer
Hubbard Spool Company
Chicago, Illinois

ROBY, J. G., Steel Mill Division
Industrial Engineering Development
General Electric Company
Schenectady, New York

SANDELIN, R. W., Chief Metallurgist
Stockham Valves & Fittings
Birmingham, Alabama

SCHNEIDER, E. J., Vice-President
Engis Equipment Company
Chicago, Illinois

SMITH, EUGENE M.
Battelle Memorial Institute
Columbus, Ohio

STIRATELLI, B. A., Development Engineer
B. F. Goodrich Company
Cleveland, Ohio

STONE, JOHN B.
Washington, D. C.

TUPPER, S. J.
Armament Research Department
Fort Halstead, Sevenoaks
Kent, England

WATKINS, S. P.
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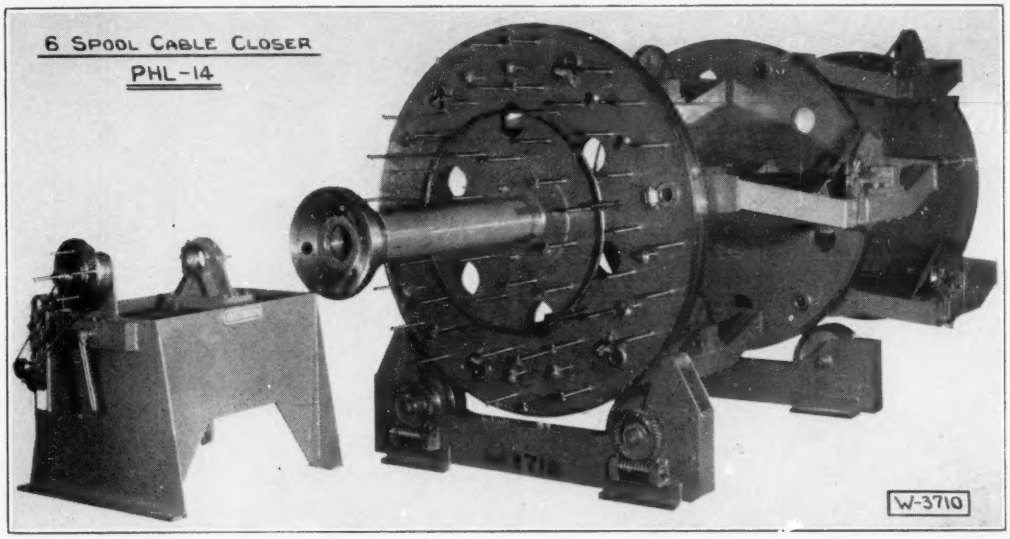
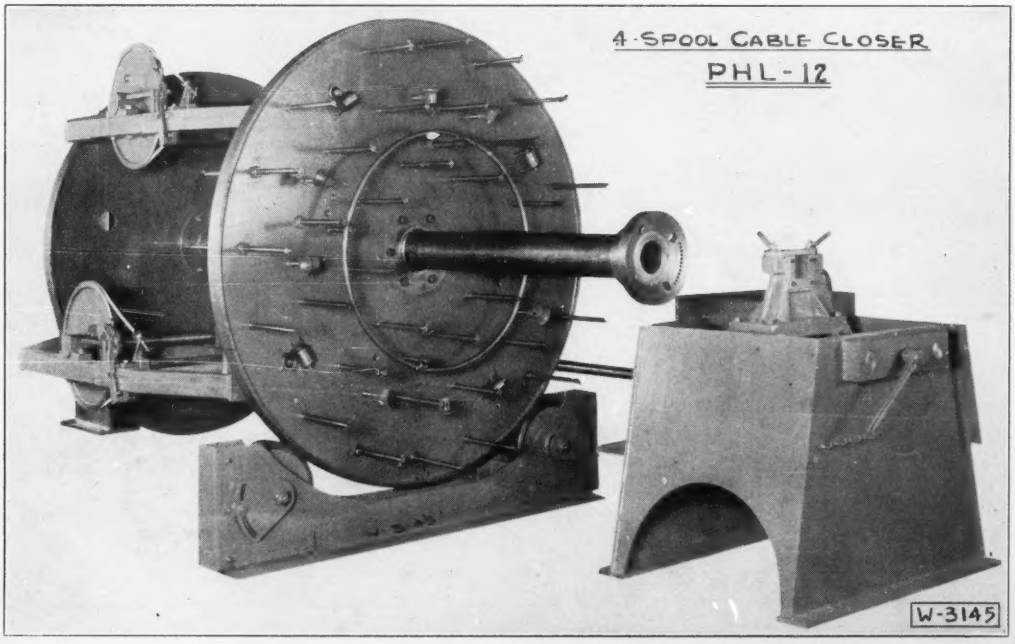


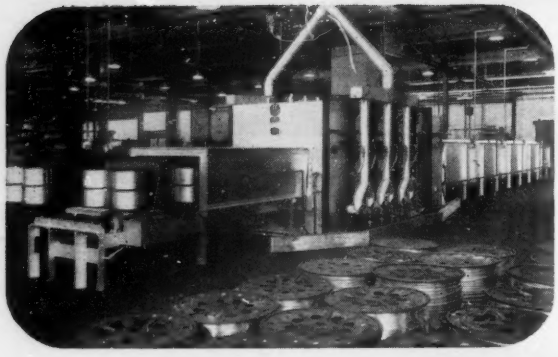
W-3710 SHOWN HERE IS FOR 60" SPOOLS AND OF L. H. ASSEMBLY

These heads are available in five sizes for spools from 24" to 60" flange diameter and in "three," "four" and "six" Spool Designs. "Right" or "Left Hand" Assembly. Reverse and Speed Change Gearing is located in Head Casing and all gearing is force-feed lubricated. Brakes are "SPRING SET AIR-OFF" and fully automatic. Interstice filler cop spindles in exit spider. NOTE: With Speed Change Gears, heads possess Lay Range and Motor advantages in direct proportion to speed change.

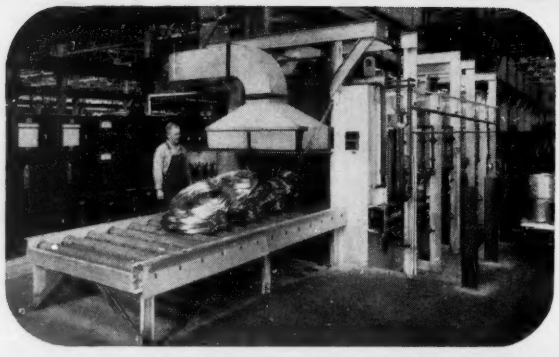
All auxiliaries such as, Tapers, Binders, Servers, Capstans, Takeups, Traverses and Letoffs usually employed with such Closers are also available in many sizes and designs.



W-3145 SHOWN HERE IS FOR 40" SPOOLS AND OF R. H. ASSEMBLY



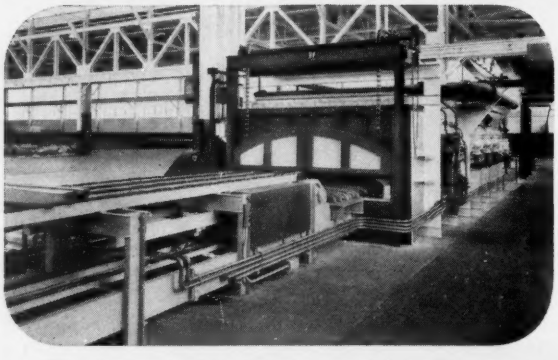
These combination electric and gas fired radiant tube bulkhead tray type furnaces are used extensively for bright annealing wire on reels and in coils.



An EF gas-fired three-chamber roller hearth with forced circulating system providing accurate temperature distribution, uniform finish and anneal—continuously.

INVESTIGATE EF DEVELOPMENTS

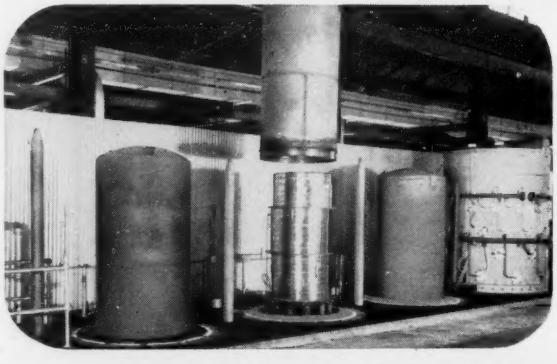
Clean annealing nickel-silver and other alloy wire in an EF gas fired radiant tube continuous roller hearth furnace. Handles coils up to 30" in diameter.



Wire bars up to 66" in length are uniformly and scale-free heated for rolling in this EF gas fired continuous pusher type furnace. Capacity 12,000 lbs. per hour.

FOR EVERY Annealing, Heating or Heat Treating PROCESS

• We have made outstanding production installations for normalizing rod and bright annealing wire in coils, strands, on reels and spools; both ferrous and non-ferrous, including stainless — for heat treating bolts, springs and other wire products — for heating billets, wire bars and other heating and heat treating processes. We solicit your furnace inquiries.



EF gas fired and electric hood, pit and other batch and continuous type furnaces are available for normalizing rod, annealing wire, strip and other processes.

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